HEALTH ASPECTS OF PESTICIDES

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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Technical Services Division of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 1150 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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73-2786. Kramer, M. (Farbwerke Hoechst, Frankfurt, Germany). **Integration of mutagenicity studies into toxicity tests.** *Ag. Actions 3(2): 118; 1973.*

Present methods for determining mutagenic potential cannot be incorporated easily into routine toxicity testing although studying fertility and reproductive performance may reveal mutagenicity. To use surviving animals from the LD50 study for chromosome analyses or the dominant lethal test necessitates exact scheduling and additional care; bone marrow must be sampled within 36 or 48 hr after administration of the test substance and a complete cycle of spermatogenesis followed. Fertility studies in rats or mice resemble the dominant lethal assay which proved to be more sensitive to the effects of thio-tepa than chromosome analysis and thus could be used for mutagenicity screening. Significant preimplantation losses and early fetal death occurred following administration of a single dose of thio-tepa at 2 mg/kg.

73-2787. Dubos, R. (Rockefeller Univ., New York, NY 10021). **Health and the environment.** *Amer. Lung Ass. Bull. 59(7): 2-6; 1973.* (1 reference)

Respiratory disease due to exposure to pesticides and other environmental pollutants is increasing. Development of useful control methods is difficult when respiratory disease is not caused by specific etiological agents. Man's lungs cannot genetically adapt to exposure to environmental pollutants because effects generally do not appear until after the reproductive period. Since years may elapse before respiratory damage is detected, extensive epidemiological studies are necessary to establish cause and effect relationships. However, some organochlorine pesticides and other chemicals do not produce effects and become dangerous except under conditions of physiological stress. High priority should be given to the study and control of air pollutants.

73-2788. Schwenke, W. (Inst. Angew. Zool., Forstwiss. Fak., Univ. Muenchen, Munich, Germany). **Waldschutz und DDT-Verbot. [Forest protection and the DDT ban.]** *Anz. Schaedlingsk. Pflanzenschutz Umweltschutz 46(4): 49-52; 1973.* (3 references) (German)

The DDT ban issued by the West German government in July 1971 permitted the use of DDT-containing agents against two forest pests until the end of 1974. Effective substitutes for DDT have been sought unsuccessfully. The German DDT ban is characterized here as a politically motivated rather than scientifically justified move which did not inconvenience agricultural or household insecticide users since most of these had already switched to other insecticides. The prohibition of DDT application in forestry would lead to extensive destruction of fir and pine trees by the pine weevil, of young firs and spruce by the budworms, and of pine trees by the sawfly. The latter pest was not even included among the uses exempted from the current ban although it is capable of rapidly destroying even well-established stands of trees and can recur in waves throughout the summer. A plea is made for continuing the exemption of pine weevil and budworm control from the DDT ban and for including the sawfly (*Dipirion* spp.) in the exemptions.

73-2789. Ashworth, R. de B. (Author address not given). **Pesticides in public health.** *Chem. Ind. (London) 14: 691-693; 1973.* (6 references)

The 4th edition of WHO's *Specifications for Pesticides Used in Public Health* contains methods of analysis and specifications for technical DDT, BHC, lindane, methoxychlor, dieldrin, pyrethrum, diazinon, malathion, trichlorfon, fenthion, dichlorvos, fenitrothion, propoxur, temephos, Abate, coumachlor, warfarin, zinc phosphide, pindone, copper sulfate, pentachlorophenol, niclosamide, 4-tritylmorpholine, and deet as well as specifications for formulations used in public health. Specifications are important in protecting the skilled formulator from unfair competition by inferior and cheaper formulations. Recently devised FAO specifications for agricultural formulations should alleviate the problem of improper use of WHO standards, but improvement of techniques for evaluating formulations is needed. DDT has received the bulk of attention from WHO since it is still most widely used, and DDT specifications are complete.

73-2790. Anonymous. **OSHA amends pesticide list; court stays effective date.** *Citrus Ind. 54(8): 11; 1973.*

Diazinon, dimethoate, dioxathion, ethion, imidan, malathion, naled, phosalone, and trichlorfon were removed from the OSHA (Occupational Safety and Health Administration) list of pesticides for which reentry dates must be set, but recommended for "permanent standard" status as a result of a flood of protests from the agricultural interests. Azinphosmethyl, carbophenothion, demeton, disulfoton, EPN, methyl parathion, mevinphos, monocrotophos, oxydemeton-methyl, parathion, phosphamidon, and TEPP remain on the emergency temporary standard list. The Fifth Federal District Court of Appeals of New Orleans has ordered a staying of the regulations. Compliance with the OSHA re-entry standards will be delayed until another court order intervenes.

73-2791. Shitskova, A. P. (Moscow F. F. Erisman Sci. Res. Inst. Hyg., Moscow, USSR). **Nekotoryye itogi issledovaniy po probleme "Pitaniye sdorovogo i bol'nogo cheloveka" v RSFSR za 1969-1971 gg. [Some results of studies on the "Nutrition of Normal and Ill Persons," carried out in the Russian SSR in the 1969-1971 period.]** *Gig. Sanit. 37(11): 69-72; 1972.* (Russian)

Studies performed at the Erisman Institute on the nutrition of healthy and sick persons and the effects of

different chemicals, such as food additives, vitamins, and pesticide residues, on humans and animals are surveyed. The protective action of nutrition regarding the biological neutralization of harmful substances was established. The effects of pesticides and their combinations were studied, and toxicological tests of new pesticide preparations were performed. Efforts were made to improve biological methods available for the hygienic and toxicological assessment of pesticides. The relationship between the alterations of tissue culture cells and the dose of the organophosphate pesticides was studied; the cytogenetic activity of trichlorfon concentrations above the maximum allowable concentration was noted.

73-2792. Anonymous. **Control of poisonous substances: agricultural pesticides. [British Columbia]** *Int. Dig. Health Legis. 24(1): 28-29; 1973.*

Regulations providing for the sale, distribution, and storage of agricultural pesticides in British Columbia have been amended. Dasanit was deleted from Appendix 1 and carbofuran, chlordane, chlorfenvinphos, DDT, chlorpyrifos, fensulfothion, gophacide, lovozal (fenazaflor), methomyl, oxydemeton-methyl, paraquat, phosalone, and trichlorant inserted. The reference to marking formulations to be recorded by the dealer and signed for by the purchaser has been deleted. Aldrin, dieldrin, endrin, DDT, heptachlor, and certain chlordane formulations can only be purchased and used with a permit.

73-2793. Anonymous. **Control of poisonous substances: pest control products. [Nova Scotia]** *Int. Dig. Health Legis. 24(1): 65-66; 1973.*

The 1970 Pest Control Products Act of Nova Scotia deals with such enforcement measures as powers of inspectors and analyst's certificates and with areas in which the Governor in Council may make regulations. These regulations may prohibit, restrict, or limit the sale, offering for sale, advertising, possession, distribution, or use of a pest control product.

73-2794. Anonymous. **Control of poisonous substances: pesticides. [Ontario]** *Int. Dig. Health Legis. 24(1): 78; 1973.*

An Act which amends the Pesticides Act, 1967, of Ontario provides for the formation of the committee known as the Pesticides Advisory Committee appointed by the Lieutenant Governor. The Committee will review annually the content and operation of the Act and make recommendations for changes, investigate any matter concerning the use of pesticides which may affect public health or the environment, and perform other functions prescribed by the regulations. The Pesticides Advisory Board has been abolished and licenses et cetera will be handled by the Pesticides License Review Board.

73-2795. Anonymous. **Environmental protection: miscellaneous provisions. [Ontario]** *Int. Dig. Health Legis. 24(1): 81-87; 1973.*

The Environmental Protection Act, 1971, of Ontario requires licensing of professional pesticide applicators and granting of a permit to those applying pesticides without a fee. The provision does not apply to persons or substances exempted by the regulations and, until amended or revoked, all licenses, permits, examinations, orders et cetera made under the Pesticides Act, 1967, will remain in effect. Under the new Act the director of a branch of the Department of the Environment which regulates pesticides may stop an extermination which is considered dangerous to the health of any person.

73-2796. Anonymous. **Protection of public health: miscellaneous provisions. [Ontario]** *Int. Dig. Health Legis. 24(1): 87-88; 1973.*

The Civil Rights Statute Law Amendment Act (Ontario), 19" , includes a number of amendments relating primar..y to licensing and revoking of licenses. The Live Stock and Live Stock Products Act, the Meat Inspection Act, 1962-1963, the Oleomargarine Act, and the Pesticides Act of 1967 are among those affected by the Amendment. Regarding the Pesticides Act, power is given to an inspector to halt an extermination he believes dangerous to health.

73-2797. Anonymous. **Control of poisonous substances: pesticides. [Malta]** *Int. Dig. Health Legis. 24(1): 183-184; 1973.*

The Importation, Sale and Use of Pesticides Regulations, Malta, 1967, were amended in 1971 to exclude from the regulations chemicals listed in the Third, Fourth, or Fifth Schedules under certain conditions: e.g. if they are imported exclusively in ready-for-use formulations expressly unsuitable for use on plants; if they are designed to be used against pests inside dwellings; or if they are imported to be used exclusively for purposes other than pest control. The five categories of pesticides have also been amended and label specifications included.

73-2798. Anonymous. **Control of poisonous substances: prohibition on the application of DDT-containing plant protection products to stored foodstuffs. [Portugal]** *Int. Dig. Health Legis. 24(1): 203; 1973.*

The Minister of Economic Affairs and the Minister of Health and Welfare of Portugal have banned the use of DDT-containing plant protection products on stored potatoes, beans, cereals, and other crops for human or animal consumption. The order went into effect March 31, 1970.

73-2799. Winteringham, F. P. W. (Joint Div. Int. Atomic Energy Agency and FAO, Int. Atomic Energy Agency, Vienna, Austria). **Some global aspects of pesticide residue problems.** *Isr. J. Entomol. 6(2): 171-181;* 1971. (32 references)

On the basis of present pesticide usage and the predicted demand for food, a 5-fold increase in world pesticide production (a level of about 7,500,000 metric tons) is possible by the year 1985. Accumulation of pesticides in circulating waters of the world has been estimated as reaching 0.1 ppm in 100 years (minus an unknown amount diffusing into non-circulating waters) even if pesticide use leveled off at a maximum of 1.5×10^{10} kg/yr. In the same amount of time the total residue accumulation in arable soil could reach 170 ppm. Degradation, dilution, dispersion, and inactivation tend to reduce the biological significance of those residues; on a limited basis concentration in the food chain, extremely heavy application, or unexpected metabolite effects aggravate the situation. A primary aim should be the development of compounds which do not persist beyond their useful lives as pesticides. Pest pheromones look promising in this area. Improved international cooperation and a realistic evaluation of risks and benefits of pesticide use are essential for study and control of the problems of environmental contamination.

73-2800. Fedchuk, N., F.; Voynarovskyy, V. L. (Volyn Reg. Admin. Food Ind., USSR). **Laboratornyi kontrol' vmistu pestytsydiv u syrovyni i kharchovykh produktakh. [Laboratory control of pesticide content in raw material and food products.]** *Kharchova Prom. 2: 57-58; 1973.* (2 references) (Ukrainian)

Determination of DDT, chlorophos (trichlorfon), polychloropinene, and hexachlorane (lindane) in raw fruit, butter, egg products, canned products, bread, flour, and malt showed a high content of pesticides which in some cases exceeded the permissible concentrations. The high concentration of pesticides in the raw material indicates a need to perfect the organization and intensify the control over pesticide residues. Some of the problems to overcome include: shortening time needed for pesticide determination, improving the precision of methods used, training the personnel, and making suitable equipment available. Two thin-layer chromatography methods, one of which involves UV irradiation, are mentioned.

73-2801. Fechner, G.; Worseck, M. (Inst. Veterinaermedizin Bezirkes Potsdam, Potsdam, DDR). **Die Anordnung ueber Rueckstaende von Pflanzenschutz- und Schaedlingsbekaempfungsmitteln in Lebensmitteln und ihre Bedeutung fuer die Veterinaermedizin. [Rule on residues of plant protection agents and pesticides in foodstuffs and its importance to veterinary medicine.]** *Monatsh. Veterinaermed. 27(22): 868-871; 1972.* (9 references) (German)

Rules on Residues of Plant Protection Agents and Pesticides in Foodstuffs, issued in East Germany June 28, 1971, and their implications for veterinary medicine are outlined. The tolerance values determined for DDT in meat, fish, animal fat, eggs, milk, and baby food are 1, 1, 2, 0.3, 0.05, and 0 ppm, respectively. The corresponding values for lindane are 0.1, 1, 0.5, 0, and 0 ppm. Theoretically, zero tolerance is required for methoxychlor, dicofol, toxaphene, endosulfan, phosdrin, dichlorvos, trichlorfon, parathion, fenitrothion, bromophos, demephion, dimethoate, chlordimeform, malathion, carbaryl, pyrethrum, piperonyl butoxide, thiram, ferbam, maneb, zineb, zireb, ziram, captan, folpet, dinocap, atrazine, simazine, propazine, prometryne, dinoseb, and copper compounds in all the above foodstuffs. The zero tolerance is regarded as a maximum allowable concentration of 0.1, 0.02, or 0.004 ppm. Compliance with the above requirements will necessitate banning the use of persistent organochlorine pesticides such as DDT in livestock farming, control of imported animal feed, and observation of the prescribed waiting periods between pesticide application and harvesting.

73-2802. Lange, H.; Kasim, M. (Veterinaeruntersuchungs- und Tiergesundheitsamt, Halle, DDR). **Zur Einsendung von Material fuer chemisch-toxikologische Untersuchungen. [Shipment of samples for chemicotoxicological tests.]** *Monatsh. Veterinaermed. 27(22): 877-879; 1972.* (German)

General guidelines on the sampling, composition, and quantity of animal and vegetable test materials, as well as on packing, labeling, storage, and transport of samples for toxicological tests are presented. Preliminary reports on poisoning accidents, indicating relevant events such as previous pesticide applications, are essential for an efficient toxicological investigation. Materials suspected to be involved in the poisoning should be analyzed in all cases. The necessary sample quantities are 500 g of gastric or intestinal content, feces, or urine; 200 g of internal organs, muscles, fatty tissue, and milk; 500 g of homogeneous, finely dispersed feed; and 1 kg of coarse and stalky feed and forage. Samples from other plants such as beet and sunflower should be at least 5 kg.

73-2803. Anonymous. **[Toxicant contents in agricultural pesticides and amounts applied to date.]** *Noyaku Bijinesu (Pestic. Business) 114: 934-936; 1973.* (Japanese)

A reply to an official questionnaire dated July 19, 1973, from a member of the Diet is presented. The status of harmful materials such as mercury in pesticides and fertilizers and the amounts of materials already applied is covered by the government in a series of published statements. The production of organomercury pesticide dust was 636,200 tons from 1953 to 1969, that of wettable powders 2,600 tons from 1957 to 1969, and that of EC 4,600 tons from 1957 to 1969. The

actual amount of already applied organomercury pesticide from 1953 to 1969 was 2,324.7 tons calculated as metallic mercury. The prefectures and amounts of organomercury pesticides, calculated as mercury more than 100 tons, are as follows: Hokkaido (120.5), Miyagi (127.0), Akita (154.0), Yamagata (113.4), Fukushima (110.6), and Niigata (123.1). Eleven tons of inorganic mercury pesticides were produced from 1957 to 1971; however, they were not directly applied in the field because of their high phytotoxicities.

73-2804. Anonymous. **Perdrix et pesticides. Quelques articles de revue et la response a la question ecrite d'un parlementaire. [Partidge and pesticides. Some review articles and reply to a written parliamentary question.]** *Phytoma 24(234): 35-36; 1972.* (French)

Studies and observations are reviewed on the effect of herbicides such as 2,4-D on partridge and other fowl in France. The reply of the Ministers of Nature Conservation, Environmental Protection, and Agriculture to a letter concerning this problem is reproduced. The decline of partridge populations throughout Europe is seen as a consequence of the liberal use of herbicides resulting in teratogenic effects on eggs and restricted availability of weed seeds for partridge consumption. Studies on the effect of 2,4-D on eggs of partridge, pheasant, and quail revealed detrimental effects of the herbicides on embryos. Excessive use of 2,4-D must be stopped to avoid decimating fowl populations.

73-2805. Lorgue, G. (Pharm. et Toxicol., Ecole Nat. Vet., Lyon, France). **Contamination chimique et ses consequences sur la vie animale. [Chemical contamination and its consequences on animal life.]** *Rev. Med. Vet. (Toulouse) 123(11): 1411-1429; 1972.* (French)

General problems of environmental pollution due to hydrocarbons, lead, mercury, and pesticides are reviewed. Successive accumulation of mercury was determined in the ecological chains. Metallic mercury is converted into methyl mercury by *Methanobacterium omelanski.* Irreversible nervous disturbances, paresthesia, visual disturbances, and motor coordination disturbances are symptoms of mercury poisoning in animals. Heptachlor epoxide residue contents of up to 15 ppm were found in eggs. Reductions of *Falco peregrinus* and *Falco sparverius* populations, observed in the U.S., were due to eggshells being too thin and fragile. A linear correlation between eggshell thickness and DDE levels was established.

73-2806. Wassermann, M.; Rogoff, M. G.; Tomatis, L.; Day, N. E.; Wassermann, D.; Djavaherian, M.; Guttel, C. (Hebrew Univ.–Hadassah Med. School, Dept. Occup. Health, Jerusalem, Israel). **Storage of organochlorine insecticides in the adipose tissue of people in Kenya.** *Ann. Soc. Belge Med. Trop. 52(6): 509-514; 1972.* (6 references)

Residues of DDT and its metabolites, β-BHC, dieldrin, and heptachlor epoxide were found in samples taken at autopsy from 83 Kenyan people who had no known occupational exposure to organochlorine insecticides. Levels of dieldrin, β-BHC, and heptachlor epoxide were below 0.1 ppm. The mean level of total DDT was 1.4 ppm in those 5-24 years old, 4.5 ppm in those 25-44, and 5.4 ppm in those 45 years and over. Since, in other studies, the group 45 years and over has exhibited both higher and lower DDT values than the 25-44 years old, the latter group is probably the best indicator for the organochlorine storage level in a community.

73-2807. Vogt, H. (Bundesforschungsanst. Kleintierzucht, Celle, Germany). **Der Einfluss von DDT im Geflueglfutter. Literaturuebersicht. [Effects of DDT in poultry feed. A literature review.]** *Arch. Gefluegelk. 36(4): 137-146; 1972.* (66 references) (German)

Information on the effects of DDT on fowl, wild and domestic, has been obtained from observations of birds under conditions of environmental contamination, residues in feed, and experimental administration. Reports on eggshell thinning in predatory birds after natural and experimental DDT/DDE exposure are numerous. Feeding experiments with pheasants and Japanese quail were generally performed at high DDT dosages and resulted in high residue levels in fat with lower levels in liver, testicles, and eggs. Mortality was lower in hens than in cocks, apparently since excretion of DDT and related compounds in the eggs represents a detoxication process. Acute poisoning of domestic fowl by DDT-contaminated feed is practically unknown, but excessive residues in poultry products may make them unacceptable. If DDT has not been used as an insecticide in poultry houses or on the birds themselves, the DDT content in eggs is generally below 0.05 ppm. In order to ensure that the content of DDT and its isomers in poultry meat does not exceed 0.5 ppm and that residues in eggs do not exceed 0.05 ppm the DDT content should not exceed 0.2 ppm in broiler rations, and 0.1 ppm in layer rations.

73-2808. Vogt, H. (Bundesforschungsanst. Kleintierzucht, Celle, Germany). **Der Einfluss von Chlorkohlenwasserstoffen (ausser DDT, DDD) im Geflueglfutter (Literaturuebersicht). [Effects of chlorinated hydrocarbons (other than DDT and DDD) in poultry feed. (Literature review).]** *Arch. Gefluegelk. 36(4): 147-158; 1972.* (80 references) (German)

A review is given of the current literature on the use of chlorinated hydrocarbon insecticides other than DDT in poultry houses and on the birds themselves. Considerable quantities of chlorinated hydrocarbon residues have been found in wild birds, and studies on domestic species closely related to wild birds revealed reproductive effects beyond a certain residue level. Acute poisoning of poultry by chlorinated hydrocarbon insecticides under practical husbandry conditions has not been reported. However, residues may be found in poultry products. Residues of methoxychlor, kelthane (dicofol), lindane, technical BHC, dieldrin, endrin, chlordane, heptachlor, and telodrin in various tissues and eggs are tabulated after feeding of active ingredients at various dietary levels for prolonged time periods. The current literature does not yet permit definite establishment of the maximum permissible chlorinated hydrocarbon levels in poultry rations. The application of chlorinated insecticides in poultry houses should be avoided to reduce the residue level.

73-2809. Heinisch, E.; Reifenstein, H.; Winkler, R. (Inst. Pflanzenschutzforsch. Kleinmachnow, Biol. Zentralanstalt, Berlin, DDR). **Zur Abbaubeschleunigung von Pflanzenschutzmittel-Wirkstoffen im Boden. [Accelerating the degradation of pesticide ingredients in the soil.]** *Arch. Pflanzenschutz 8(4): 313-321; 1972.* (9 references) (German)

Methods for accelerating the dissipation of pesticide residues from the soil generally entail assisting natural degradation and removal processes. Intensive cultivation and irrigation of a truck gardening field permitted the removal of the large quantities of lindane (3-4 times the recommended annual application rate) required for cultivating two crops a year. Calcium polysulfide has been suggested as a soil additive to promote chemical decomposition of triazine herbicides. Sodium chlorate residues have persisted at toxic levels for up to six weeks after application in loam soils. Since chlorate ion is a strong oxidizing agent in acid solution, application of a sulfite waste liquor to soil was studied for neutralization of chlorate residues. In vitro tests revealed that the chlorate-chloride reduction is highly pH-dependent and generally does not proceed to completion. The sulfite in the solution (as well as sodium nitrite, which could also be considered as a soil decontaminant because of its availability in large quantities at a low price) is broken down at a low pH, losing effectiveness. Field experiments generally confirmed the poor laboratory results with this decontamination method although these experiments have not been completed.

73-2810. Markicevic, A.; Prpic-Majic, D.; Bosnar-Turk, N. (Inst. Med. Istrazivanja Med. Rada JAZU, Zagreb, Yugoslavia). **Rezultati ciljanih pregleda radnika eksponiranih dinitroortokrezolu (DNOC). [Results of examinations of workers exposed to dinitro-*ortho*-cresol.]** *Arh.*

Hig. Rada Toksikol. 23(1): 1-9; 1972. (12 references) (Serbocroatian)

Clinical findings and serum/urine DNOC levels were recorded in 27 chemical plant workers exposed to dinitro-*ortho*-cresol (DNOC) by dermal contact. The method of Parker was employed in DNOC determinations. None of the workers examined showed signs of DNOC poisoning, and DNOC levels in biological materials were within acceptable limits. Occupational stigmata (yellow coloration of nails, skin, and hair) possibly indicative of contact with DNOC were present in 16 of the workers, but were not correlated with elevated serum or urine DNOC. No significant abnormalities which could be correlated with occupational DNOC exposure were noted in blood pressure, pulse rate, or urinalysis. Serum DNOC concentrations ranged from 1.0 to 8.7 μg/ml, averaging about 3 μg/ml. Urine DNOC concentrations were 0-4.2 μg/ml, averaging 1-2 μg/ml.

73-2811. Hayashi, M. (Dept. Maternal Child Health, Inst. Pub. Health, Tokyo, Japan). **Contamination of human milk with agricultural pesticides.** *Asian Med. J. 16(6): 323-335; 1973.*

English translation; for an abstract of the original Japanese article, *Nippon Ishikai Zasshi (J. Jap. Med. Ass.)* 68(12): 1281-1286; 1972, see abstract no. 73-1057.

73-2812. Fung, K. H.; Belcher, R. S.; Whitfield, D. M. (Dept. Agr., Div. Agr. Chem., Melbourne, Victoria, Australia). **Spray damage and residue levels in tobacco treated with various concentrations of 2,4-D at different stages of growth.** *Aust. J. Exp. Agr. Anim. Husbandry 13(62): 328-334; 1973.* (9 references)

Tobacco plants sprayed with 2,4-D amine at four growth stages were damaged by the 100 ppm dose in three of the stages. An assay procedure was developed for determination of residues in tobacco plants and in irrigation water. At 16 days after treatment residues in tobacco plants treated with 100 ppm 2,4-D amine averaged 0.9 ppm; at the 10 ppm treatment rate residues were 0.08 ppm; at 1.0 ppm residues were 0.03 ppm; and at 0.1 ppm residues were 0.02 ppm. Residue levels in untreated control plants ranged from 0.005 to 0.02 ppm. These traces could have been derived from the quantities (0.0 to 0.3 ppb) of 2,4-D in river water used for irrigation.

73-2813. Alexander, M. (Lab. Soil Microbiol., Dept. Agron., Cornell Univ., Ithaca, NY 14850). **Biotechnology Report. Nonbiodegradable and other recalcitrant molecules.** *Biotechnol. Bioeng. 15(4): 611-647; 1973.* (129 references)

Pesticides are an important group of synthetic chemicals which may or may not be degraded when released into the environment. Organophosphates are replacing the persistent organochlorines although some of these substitutes have persisted for 15 years. Some of the persistent pesticides like DDT and aldrin are modified either by microorganisms or through nonbiological means, but the product is not rapidly degraded. The polychlorinated biphenyls which have the highest chlorine content tend to accumulate and be magnified in the food chain like the persistent pesticides. Although generalizations are not evident concerning the effects of individual molecular substituents on resistance, the number and position of such substituents govern degradability in a number of dissimilar chemicals. Factors contributing to the recalcitrance of environmental chemicals include: nonexistence of an active organism; lack of similarity of the chemical to substrates of enzymes which catalyze breakdown; lack of sufficient energy or nutrients for growth of organism; toxicity of chemical to organism; failure of chemical to penetrate the cell; and low concentration or inaccessibility of substrate.

73-2814. Baird, D. D. (Univ. Tennessee, Knoxville, TN). **An investigation of some of the environmental and edaphic factors effecting the detoxication and subsequent degradation of an herbicide, butachlor.** *Diss. Abstr. Int. 32(11): 6150B; 1972.*

The influence of specific edaphic environmental factors on the detoxication and subsequent degradation of *N*-butoxymethyl-2-chloro-2′,6′-diethylacetanilide (butachlor) was evaluated under greenhouse and growth chamber conditions. Detoxication of butachlor, as measured by bioassay with barnyardgrass, was significantly enhanced by increasing temperatures to 32°C, making the soil alkaline, flooding, introducing relatively high levels of organic matter, and by allowing exposure of more than four weeks. Total degradation of butachlor to CO_2 was enhanced also by high temperatures and length of exposure but was inhibited to a certain extent by flooding. Soil produced metabolites, of which three were soluble in certain organic solvents and five were water soluble, were also influenced by environmental factors, temperature and length of exposure being most significant. Flooding influenced the formation of certain metabolites soluble in organic solvent but did not influence the presence or amounts of water soluble metabolites. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 72-15,504.)

73-2815. Lockwood, L. M. (Kansas State Univ., Manhattan, KS). **Organophosphate pesticides for use as grain protectants in India: degradation of their residues during milling and cooking of cereal grains.** *Diss. Abstr. Int. 34(1): 2B-3B; 1973.*

From 30 to 70% of the Sumithion (fenitrothion), malathion, or Gardona (tetrachlorvinphos) applied to

wheat and sorghum for protection during storage was degraded or otherwise lost during machine milling. The degree of heating that took place seemed to affect the residue loss since sorghum grinding produced less heat and a slower loss of residue and hand milling resulted in a 40% decrease in loss. Rough rice treated with malathion at rates up to 80 ppm contained very little of the residue applied after polishing. Boiling or steaming the products by traditional Indian methods resulted in complete loss of residues. Recommendations have been made in India to allow the use of malathion as a grain protectant. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 73-16,991.)

73-2816. Huggenberger, F. (Univ. California, Riverside, CA). **Adsorption and mobility of pesticides in soils.** *Diss. Abstr. Int. 34(1): 19B; 1973.*

Infiltration experiments with lindane, designed to test a mathematical model, indicated that application of increasing amounts of the insecticide to the soil surface increased the concentration but did not affect the depth of penetration. Using diuron, an increase in the adsorption coefficient reduced the depth of maximum concentration as predicted, but considerable error was obtained in predicting the depth of maximum concentration of atrazine. When surfactants were added to pesticide preparations in low concentrations, such as those expected when field sprays are diluted in the soil, the adsorption and mobility of the pesticides were not affected. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 73-15,636.)

73-2817. Burnett, R. D. (Stanford Univ., Palo Alto, CA). **DDT in marine phytoplankton and crustacea.** *Diss. Abstr. Int. 34(2): 533B; 1973.*

The concentrations of *p,p'*-DDT, *p,p'*-DDD (TDE), and *p,p'*-DDE in *Emerita analoga* from California beaches reflect total-DDT contamination nearby. The concentrations in *Emerita* collected in November 1970 from beaches near the Los Angeles County sewer outfall were over 45 times those in animals near agricultural drainage areas. The concentrations in animals collected a year later, following greatly diminished input, were only slightly reduced. Concentrations in animals collected for three years from an open coast beach showed an arithmetic decline with time; those in animals collected near an agricultural drainage river showed an exponential decline with time after DDT use in that area was curtailed. The rate of uptake of DDT into *Dunaliella salina, Phaeodactylum tricornutum, Tigropius californicus,* and *Emerita* was exponential. The mode of uptake is species specific. *Tigropius*, a copepod, fed for three weeks on phytoplankters exposed to eight parts per trillion DDE in seawater, evidenced reduced growth rate and egg laying six months after the beginning of observation. No breakdown of DDT in the phytoplankton used as food was detected. Much of the DDT in the *Tigropius* was broken down to *p,p'*-DDE, and little or none to DDD. The culture water containing the animals' fecal pellets contained much DDD and DDE as well as the original DDT. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-14,872.)

73-2818. Gaynor, J. D. (Oregon State Univ., Corvallis, OR). **Atrazine, terbutryn and GS-14254 adsorption, desorption and solubility in salt solutions and movement in soil materials.** *Diss. Abstr. Int. 34(3): 951B; 1973.*

Adsorption-desorption experiments with herbicides on Cloquato soil indicated that salt concentrations in the soil solution would not be high enough to reduce *s*-triazine solubility. Low salt concentrations would reduce GS-14254 and terbutryn adsorption, thus increasing phytotoxicity. GS-14254 and terbutryn adsorption always decreased when the soil pH increased upon addition of base whereas atrazine adsorption increased in some soils. Soils high in clay and carbon content greatly reduced the effect of pH on *s*-triazine adsorption. Atrazine adsorption occurred in the soil carbon fraction whereas GS-14254 and terbutryn showed equal affinity for organic and clay mineral surfaces. Atrazine and terbutryn losses in transported sediment and runoff water from herbicide treated areas are not great enough to create a threat to nontarget organisms or surrounding crops. Because of high adsorption, atrazine and terbutryn leaching in unlimed and limed soil was restricted to the top 23 cm of soil after addition of 15 cm of rainfall. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-21,305.)

73-2819. Kuo, E. C. (Oregon State Univ., Corvallis, OR). **The reactions of picloram and 2,4-D with montmorillonite clays and soils.** *Diss. Abstr. Int. 34(3): 952B-953B; 1973.*

Mobility and adsorption of picloram and 2,4-D on 43 western soils, measured with soil thin-layer chromatography and batch equilibration techniques, were correlated with soil pH, organic matter content, and aluminum extracted with ammonium acetate at pH 4.8. Predicted adsorption based on these values deviated by 6.1% for picloram and 7.3% for 2,4-D from measured adsorption values. Predictability was better for soils with pH < 7. Picloram solubility was increased in salt solutions less than 0.5 *N* and decreased in salt solutions of 0.5 *N* or higher. Picloram mobility was reduced by addition of charcoal to soils. Adsorption of picloram by H-montmorillonite increased as suspension pH decreased. With an increase in acidity, the picloram was hydrogen bonded to the clay colloid surface. Spectral studies indicated that the picloram molecule could not

accept an extra proton due to its dipolar nature, low basicity, and the presence of strong electron withdrawing chloro and carboxylate functional groups. The annular nitrogen of picloram, rather than the carbonyl oxygen, interacted with hydrogen or aluminum atoms of montmorillonite. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-21,315.)

73-2820. Nose, K. (Dept. Pathol. and Entomol., Nat. Inst. Agr. Sci., Min. Agr. Forestry, Tokyo, Japan). **[Environmental diffusion and soil residue of pesticides.]** *Eisei Kagaku (J. Hyg. Chem.) 19(4): 177-188; 1973.* (36 references) (Japanese)

The ideal pesticide has now greatly changed from one of strong persistency to weak persistency; the safety evaluation of a pesticide has also changed from acute toxicity to chronic toxicity. Pesticide residues in crops and in soil are now a great problem. The author first refers to *Silent Spring* and then the dynamic status of DDT seen from the global viewpoint and calculated by a simulated system by Randes. The author presents the theoretical residue amounts of repeatedly applied and continuously decomposed pesticides. Experimental results on pesticide residues are shown for BHC and organomercury fungicide as are typical degradation routes of ester pesticides such as hydrolysis and hydroxylation of *N*-alkyl and aromatic rings. *N*-hydroxylation and de-alkylation are indicated on representative pesticides. Relatively stable intermediate compounds are shown. With DDT and BHC banned the present pesticides which are relatively resistant to microorganisms in the soil are dicofol, tetradifon, and endosulfan. The pesticides which showed persistency more than a month in soil are ethylthiometon, dimethoate, leptophos, Bassa (*o-sec* butylphenyl *N*-methylcarbamate), aprocarb, MTMC, and Meobal. There are many herbicides having a half-life in soil of more than one month; however, the time of application is only once a year. These are applied early in the year, and residues in crops would be far less than those of insecticides and fungicides.

73-2821. Wedemeyer, C. (West. Fish. Dis. Lab., Bur. Sport Fish. Wildlife, Sand Point Naval Support Activity, Seattle, WA). **Environmental contamination by persistent pesticides.** *Univ. of Washington Publ. Fish. New Ser. 5: 69-75; 1972.* (31 references)

A selective review of literature concerning the occurrence, distribution, and effects of persistent pesticides in the environment indicates that the organochlorines are the least susceptible to biodegradation. The organophosphates and carbamates are more subject to degradation and are rarely stored in animal tissues. Significant levels of organochlorine pesticides are observed in higher trophic levels after application to an ecosystem. Since fish monitored close to the mouth of a major river contained higher residues than those obtained further away in the ocean, agricultural runoff must be a major source of pesticide contamination of natural waters. The long persistence of DDT in the soil may be in part due to the fact that anaerobic conditions are required for the conversion of DDT to DDE, the first step in the degradation to DDA. DDT and other chlorinated hydrocarbons have been implicated in loss of wildlife through eggshell thinning. Their use, although essential in some areas of public health and agriculture, should be regulated to minimize unknown, long-term effects in man.

73-2822. Buhler, D. R.; Rasmusson, M. E.; Nakaue, H. S. (Dept. of Agr. Chem. and Environ. Health Sci. Cent., Oregon State Univ., Corvallis, OR 97331). **Occurrence of hexachlorophene and pentachlorophenol in sewage and water.** *Environ. Sci. Technol. 7(10): 929-934; 1973.* (8 references)

Concentrations of hexachlorophene (HCP) and pentachlorophenol (PCP) in sewage and water samples have been analyzed by gas chromatography. HCP and PCP levels in 24-hr composite samples of sewage influent collected simultaneously from three Oregon cities ranged between 20-31 ppb and 1-5 ppb, respectively. Composite effluent values from these same sewage treatment plants were 6-12 ppb HCP and 1-4 ppb PCP, reflecting a 60-70% removal of HCP and a 4-28% removal of PCP. Analyses of daily and hourly water samples from the Willamette River collected just upstream from the city of Corvallis, Ore., showed that HCP and PCP were present in river water in concentrations varying between 0.01-0.1 ppb and 0.10-0.70 ppb, respectively. Conventional processing of raw Willamette River water at the Corvallis Taylor water treatment plant removed about 60% of the HCP and PCP originally present in the water leaving about 40% of these chlorophenols in the finished drinking water. Identifications of HCP and PCP in sewage effluent and influent, Willamette River water and treated drinking water were confirmed by mass spectrometry. (Author abstract reprinted by permission of the American Chemical Society)

73-2823. Hughes, R. A.; Lee, G. F. (Univ. Wisconsin, Madison, WI 53706). **Toxaphene accumulation in fish in lakes treated for rough fish control.** *Environ. Sci. Technol. 7(10): 934-939; 1973.* (26 references)

The addition of toxaphene to several Wisconsin lakes for fish management purposes provided an opportunity to study some aspects of the persistence of toxaphene in aquatic communities. After toxaphene was added to three shallow, hard-water, nutrient-rich Wisconsin lakes to destroy stunted or rough fish populations, concentrations of the chemical remaining in the water and plankton were monitored until residue levels became nondeterminable. Bluegills accumulated residue toxaphene concentrations of nearly 10 μg/g and reproduced successfully. Toxaphene and toxaphene residue accumulation were more closely related to fat content of

fish than to fish weight. Edible flesh of bluegills contained less than 10% of the whole body burden of toxaphene residues, and as much as 27% of the residues in this tissue was removed by pan frying. (Author abstract reprinted by permission of the American Chemical Society)

73-2824. Nayshteyn, S. Ya.; Zhulinskaya, V. A.; Yurovskaya, Ye. M. (Kiev O. M. Marzeyev Sci. Res. Inst. Pub. Commun. Hyg., Kiev, USSR). **O stabil'nosti nekotorykh fosfororganicheskikh pestitsidov v pochve. [The stability of certain phosphororganic pesticides in the soil.]** *Gig. Sanit. 38(7): 42-45; 1973.* (4 references) (Russian)

The stability and decomposition of trichlorfon, carbofos (malathion), and metaphos (methyl parathion) in artificially acidified and alkalinized soils with the respective pH ranges of 3-4.6 and 8.7-9.6 were studied. The pesticides were applied at 2 and 200 mg/kg with the soil temperature at 18-20° C. Stability increased in all pesticides investigated in acidic soils. Trichlorfon concentrations of 200 mg/kg persisted for two months, but for only one month in alkaline soil where persistence was found a function of the initial concentration. Trichlorfon in a concentration of 200 mg/kg persisted in the soil for one month but at 2 mg/kg concentration was no longer detectable after one month. The retention was longest in acidic soil, especially for high pesticide concentrations. The persistence in the soil decreased from metaphos to carbofos and to trichlorfon. Since the rate of decomposition in native and sterile soils was comparable, it can be concluded that the role of the soil microorganisms in the destruction of trichlorfon, metaphos and carbofos is of secondary importance compared to that of chemical reactions.

73-2825. Campean, C.; Campean, N. (Fac. Vet. Med., Bucharest, Rumania). **Eliminarea pesticidelor prin lapte. [Excretion of pesticides in milk.]** *Ind. Aliment. (Bucharest) 24(6): 321-322; 1973.* (19 references) (Rumanian)

A large number of investigations has revealed that pesticides ingested by dairy cows via contaminated forage are excreted in the milk. Dermal absorption, following application of pesticides to the animals' skin for ectoparasite control, can also lead to milk contamination. Excretion of pesticides in milk continues for varying lengths of time after a single instance of ingestion, depending on the metabolic fate of the pesticide and the amount ingested. Although excretion of organophosphates and herbicides generally continues for only a few days after exposure, organochlorine contamination of dairy products is practically universal at present. In addition to threatening the health of persons who consume contaminated milk, pesticides can directly impair the quality of dairy products and the milk-producing capacity of the cow. Individual countries, as well as the World Health Organization, have established regulations and recommendations governing the permissible pesticide concentrations in dairy products.

73-2826. Harvey, Jr., J.; Pease, H. L. (Biochem. Dept., E. I. du Pont de Nemours Co., Inc., Wilmington, DE 19898). **Decomposition of methomyl in soil.** *J. Agr. Food Chem. 21(5): 784-786; 1973.* (4 references)

Laboratory studies of soils treated with [^{14}C]methomyl show that methomyl degrades rapidly to [^{14}C]carbon dioxide as the end product. Under field conditions in Delaware only 1.8% of the applied [^{14}C]methomyl remained intact in the soil after one month exposure, while 70.7% of the applied radioactivity had been lost from the soil by volatilization, presumably as [^{14}C]carbon dioxide based on the laboratory studies. The small amounts of residual radioactive compounds which could be extracted from this soil consisted of methomyl, *S*-methyl *N*-hydroxythioacetimidate, and traces of a mixture of very polar compounds. Methomyl and its hydrolysis product had completely disappeared from treated soil after one year. Similar results were obtained in Florida and North Carolina. To account for the small, unextractable balance of ^{14}C activity, evidence is presented for reincorporation of ^{14}C into normal components of the soil organic matter following breakdown of [^{14}C]methomyl into $^{14}CO_2$ or other small fragments. A runoff study with nonradiolabeled methomyl under farm use conditions shows that methomyl does not move laterally into untreated areas with runoff water. (Author abstract reprinted by permission of the American Chemical Society)

73-2827. Graham, R. E.; Burson, K. R.; Hammer, C. F.; Hansen, L. B.; Kenner, C. T. (Dallas Dist. U. S. Food Drug. Admin., Dallas, TX 75204). **Photochemical decomposition of heptachlor epoxide.** *J. Agr. Food Chem. 21(5): 824-834; 1973.* (24 references)

The progressive decomposition of solid heptachlor epoxide (I) in KBr disks is followed by a study of the changes which occur in the infrared spectrum with time of exposure to ultraviolet radiation and sunlight. The products obtained by photodecomposition in KBr disks are identical to those obtained by exposure of solid I to sunlight and ultraviolet radiation and include a semicage ketone and an intermediate which may be converted to an enantiomeric semicage ketone. The mechanism proposed accounts for the intermediate and final products and is based upon structure determinations by infrared, nuclear magnetic resonance, mass spectrometry, and ultraviolet absorption. A study of the factors which affect the rate and extent of decomposition in the KBr solid state technique shows that the time of exposure can be controlled to produce a maximum yield of intermediate or final products. The amount of decomposition in any given sample is calculated by the absorbance ratio technique. (Author abstract reprinted by permission of the American Chemical Society)

73-2828. Mosier, A. R.; Guenzi, W. D. (U. S. Dept. Agr., Agr. Res. Serv., Fort Collins, CO 80521). **Picloram**

photolytic decomposition. *J. Agr. Food Chem. 21(5): 835-837; 1973.* (16 references)

Picloram (4-amino-3,5,6-trichloropicolinic acid), as the sodium salt in aqueous solution, readily decomposed when irradiated with ultraviolet light (300-380 nm). During photolysis, two chloride ions were produced per molecule of picloram photolyzed. Evidence was obtained to suggest that both a free radical and an ionic mechanism are involved in the photolysis of picloram. The overall reaction proceeds by a nonchain mechanism. (Author abstract reprinted by permission of the American Chemical Society)

73-2829. Exner, J. H.; Burk, G. A.; Kyriacou, D. (Halogens Res. Lab., The Dow Co., Midland, MI 48640). **Rates and products of decomposition of 2,2-dibromo-3-nitrilopropionamide.** *J. Agr. Food Chem. 21(5): 838-842; 1973.* (20 references)

Rates and products of decomposition of 2,2-dibromo-3-nitrilopropionamide (DBNPA), an antimicrobial compound used for industrial water treatment and as a seed dressing, were determined over a range of conditions. Rates of hydrolytic decomposition, determined polarographically at various pHs and temperatures, are consistent with acid- and base-catalyzed amide hydrolysis. Hydrolysis of DBNPA ultimately forms carbon dioxide, ammonia, and bromide ions via the following sequence of degradation products: dibromoacetonitrile, dibromoacetamide, dibromoacetic acid, glyoxylic acid, and oxalic acid. DBNPA reacts rapidly with various ions such as bisulfite to form cyanoacetamide. Decomposition under the influence of sunlight also leads to cyanoacetamide. Contact with soil and soil organisms degrades DBNPA. Decomposition of DBNPA by several chemical and biological pathways ensures that the compound will not persist in the environment. (Author abstract reprinted by permission of the American Chemical Society)

73-2830. Sikka, H. C.; Rice, C. P. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Persistence of endothall in aquatic environment as determined by gas-liquid chromatography.** *J. Agr. Food Chem. 21(5): 842-846; 1973.* (9 references)

A gas chromatographic method was used to determine the residues of endothall in both the water and hydrosoil of a farm pond and of laboratory aquaria. The bulk of endothall added to the aquaria remained in the water during the course of the experiment. Both in the pond and in the aquaria, the herbicide persisted in the hydrosoil for a longer period than in the water. In the pond treated with approximately 2 ppm of endothall the herbicide could not be detected in the water and top 1 in. of the hydrosoil 36 and 44 days after treatment, respectively. In the aquaria treated with 2 and 4 ppm endothall was reduced to nondetectable levels in the water within 7 days after treatment. It took 2 and 4 weeks for the herbicide in the hydrosoil to reach a level of less than 0.1 ppm in the aquaria treated with 2 and 4 ppm respectively. The rate of endothall dissipation in the aquaria was similar at both application rates. (Author abstract reprinted by permission of the American Chemical Society)

73-2831. Westlake, W. E.; Ittig, M.; Ott, D. E.; Gunther, F. A. (Dept. Entomol., Univ. California Citrus Res. Cent. Agr. Exp. Sta., Riverside, CA 92502). **Persistence of residues of the insecticide phosphamidon on and in oranges, lemons, and grapefruit, and on and in orange leaves and in dried citrus pulp cattle feed.** *J. Agr. Food Chem. 21(5): 846-850; 1973.* (8 references)

The dissipation rates of phosphamidon on and in oranges, lemons, and grapefruit were determined; the degrading deposit half-lives were 3-5 days and the persisting residue half-lives were 10-12 days. Dosages from 0.5 to 1.5 lb a.i./acre yielded maximum initial deposits of about 1.5 ppm (rind basis) after 28 days. Residues declined slightly more rapidly on leaves than on fruit. The persisting residues on all varieties of fruit and on orange leaves remained largely on the surface for as long as 28 days after application, i.e., they were largely dislodgable residues. There was indication of only slight, if any, translocation into the edible portion of any of these fruits; the highest level detected was 0.02 ppm in lemon juice sacs 1 day after application. The *cis* isomer of phosphamidon disappeared slightly more rapidly than the *trans* isomer. *N*-Desethylphosphamidon was not detected in any sample (< 0.01 ppm). About 90% of the phosphamidon in orange rind (0.04 ppm, 14-day sample) was lost in processing the rind into dried citrus pulp cattle feed. (Author abstract reprinted by permission of the American Chemical Society)

73-2832. Kohli, J.; Zarif, S.; Weisgerber, I.; Klein, W.*; Korte, F. (Inst. Oekol. Chem., Schloss Birlinghoven, Ges. Strahlen- und Umweltforschung mbH, Munich, Germany). **Fate of aldrin-^{14}C in sugar beets and soil under outdoor conditions.** *J. Agr. Food Chem. 21(5): 855-857; 1973.* (2 references)

Aldrin-^{14}C has been applied to soils under outdoor conditions in Germany (2.9 kg/ha) and England (3.2 kg/ha), and sugar beets have been grown. Upon harvest, more than 95% of the total radioactivity recovered from the plants and more than 40% of the radioactivity recovered from the soils were due to metabolites, mainly dieldrin and a group of hydrophilic metabolic products. The main hydrophilic compound was identified as dihydrochlordene-^{14}C dicarboxylic acid (1,2,3,4,8,8-hexachloro-1,4,4a,6,7,7a-hexahydro-1,4-endomethylene-indene-5,7-dicarboxylic acid); additionally, photodieldrin and two minor acidic compounds were detected. Between 52 and 58% of the total residue in the surface soils was aldrin, but the percentage of aldrin decreased with increasing depth. Only very low

residues were detected in the deeper soil layers in England whereas more radioactivity was found in the soil samples in Germany. (Author abstract reprinted by permission of the American Chemical Society)

73-2833. Dale, W. E.; Miles, J. W.; Weathers, D. B. (Tech. Develop. Lab., Cent. Dis. Contr., Malaria Program, Health Serv. Ment. Health Admin., Pub. Health Serv., HEW, Savannah, GA 31402). **Measurement of residues of dichlorvos absorbed by food exposed during disinsection of aircraft.** *J. Agr. Food Chem. 21(5): 858-860; 1973.* (9 references)

Improved methods for extraction, cleanup, and gas chromatographic analysis have been developed for determination of dichlorvos (2,2-dichlorovinyl dimethyl phosphate, DDVP) in foods. The methods have been used to determine the residues absorbed by food exposed to dichlorvos concentrations used in in-flight disinsection of aircraft. Whole meals exposed for 30 min to 0.25 μg/l. of dichlorvos absorbed approximately 0.18 ppm. Approximately one-tenth of this concentration was found in beverages similarly exposed while concentrations in margarine were three times as high. The method is sensitive to 0.005 ppm of dichlorvos. (Author abstract reprinted by permission of the American Chemical Society)

73-2834. Grunwell, J. R.; Erickson, R. H. (Dept. Chem., Hughes Lab., Miami Univ., Oxford, OH 45056). **Photolysis of parathion (*O,O* diethyl-*O*-(4-nitrophenyl)-thiophosphate). New products.** *J. Agr. Food Chem. 21(5): 929-931; 1973.* (13 references)

O,O,S-Triethylthiophosphate was identified as the major product of the photolysis of parathion in aqueous THF or ethanol. Minor products were *O,O,O*-triethylthiophosphate, paraoxon, and triethylphosphate, which was formed by secondary photolysis of paraoxon. (Author abstract reprinted by permission of the American Chemical Society)

73-2835. Hemken, R. W. (Univ. of Kentucky, Lexington, KY). **Contamination of dairy feed and its effect on milk quality.** *J. Dairy Sci. 56(2): 315; 1973.*

The definition of quality milk not only includes presence of normal amounts of essential nutrients but also the absence of contaminants. Some compounds pass from feed to milk with little or no change in composition, and amount found in milk is directly related to amount in feed. In other cases, level is mediated by the udder. Problems of chemical contamination of milk have been recognized because new chemical procedures have been developed. Detection of some chlorinated hydrocarbon pesticides and current problems with polychlorinated biphenyls are examples of increased sensitivity of chemical procedures leading to realization of presence of contaminants. Additional research is needed to determine extent and degree of PCB occurrence in silos which eventually contaminates milk. Use of feed additives means that close surveillance of milk is needed to insure continued high quality of milk and milk products. (Author abstract by permission, abridged)

73-2836. Getzendaner, M. E. (Dow Chemical Company, Midland, MI). **Fate of herbicides on forage crops.** *J. Dairy Sci. 56(2): 315; 1973.*

Residues of herbicides at intervals after application to a forage crop decrease rapidly with time. Initial deposit is directly proportional to application rate while rate of decrease is independent of application rate. This permits calculation of a specific residue figure defined as ppm of residue per pound of chemical applied per acre (ppm/lb/A). Animals fed known amounts of a given herbicide show a generally low residue in meat, milk, and eggs. These data are used as part of the information to establish post-application intervals for feeding of forage and tolerances in meat, milk, and eggs. Several herbicides will be discussed to illustrate this concept. (Author abstract by permission)

73-2837. Schaefer, C. H.; Dupras, Jr., E. F. (Mosquito Control Res. Lab., Univ. of California, Fresno, CA 93727). **Insect developmental inhibitors. 4. Persistence of ZR-515 in water.** *J. Econ. Entomol. 66(4): 923-925; 1973.* (6 references)

Residues of ZR-515 (isopropyl 11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate) were greatly affected by sunlight and temperature. The technical ZR-515 tended to remain on the water surface, and its distribution was affected by wind. The half-life of technical ZR-515 or an EC formulation in field water was only about two hours. Treatments of 10 percent flowable liquid (slow release) formulation in water showed almost no detectable residues by chemical analysis after 24 hours, although biological activity persisted for several days. (Author abstract by permission)

73-2838. Lindquist, R. K.; Krueger, H. R.; Mason, J. F.; Spadafora, R. R. (Dept. Entomol., Ohio Agr. Res. Dev. Center, Wooster, OH 44691). **Application of diazinon to greenhouse tomatoes: vegetable leaf miner control and residues in foliage and fruits.** *J. Econ. Entomol. 66(4): 1001-1002; 1973.* (7 references)

The vegetable leaf miner has become a serious pest of greenhouse tomatoes. Diazinon effectively controls leaf miner larvae in the field, but is not registered for use on greenhouse-grown crops. Diazinon was applied to greenhouse tomatoes as a solution with 0.015 or 0.03% active ingredient; three applications at each rate were made 10 days apart, and fruits were harvested for residue analysis 1, 3, 8, or 10 days after insecticide application. The gas-liquid chromatographic analytical

procedure applied was sensitive to 0.006 ppm diazinon and 0.024 ppm diazoxon. Diazinon residues in tomatoes were 0.028 ppm 1 day after treatment and 0.008 ppm 8 days after treatment at the 0.015% rate; 0.150 ppm 1 day after treatment and 0.037 ppm 8 days after treatment at the 0.03% rate. Diazoxon was not detected in any sample. All residue levels were well below the tolerance for diazinon on field-grown tomatoes (0.75 ppm).

73-2839. Frank, R.; Ronald, K.; Braun, H. E. (Pestic. Residue Lab., Ontario Min. of Agr. and Food, Guelph, Ontario). **Organochlorine residues in harp seals (*Pagophilus groenlandicus*) caught in eastern Canadian waters.** *J. Fish. Res. Board Can. 30(8): 1053-1063; 1973.* (13 references)

From 1969 to 1971, 78 harp seals (*Pagophilus groenlandicus*), ranging in age from newborn to 18 years were obtained from the Gulf of St. Lawrence and the Newfoundland and Labrador coasts (Front). A further 12 seals captured in the Gulf died (in captivity) after being held for various periods of time. Total DDT and metabolites (ΣDDT) in the blubber of wild beaters and bedlamers from the Gulf were >2 ppm, from the Front <2 ppm. DDT levels increased to 8.7 ppm as the animals matured, and in females leveled off at 6.5 ppm when the breeding age was reached. Dieldrin levels were only 5% of those for Σ DDT and did not accumulate appreciably in either wild or captive seals. PCB residues were only slightly less than Σ DDT and showed a similar increase with the age of the seal. Residues in tissues of captive seals were as much as eight times higher than in nature, indicating either that natural diets contain lower residues than the selected, often monospecfic diet, or differing rates of assimilation of organochlorines in wild and captive animals. The differences between levels in wild seals from the Gulf and Front may offer evidence for subpopulation groups in the harp seals of the North West Atlantic. In seals examined brain lipids contained between 7 and 20% of concentrations of all three chlorinated hydrocarbons found in the extractable fat of blubber, muscle, and liver, indicating a brain barrier. (Author abstract by permission)

73-2840. Huckabee, J. W.; Cartan, F. O.; Kennington, G. S. (Oak Ridge Nat. Lab., Oak Ridge, TN). **Distribution of mercury in pheasant muscle and feathers.** *J. Wildl. Manage. 36(4): 1306-1309; 1972.* (12 references)

One hundred forty-eight pheasants (*Phasianus colchicus torquatus*) from Idaho were tested by neutron activation analysis at the National Reactor Testing Station, Idaho, in August 1970 to check for possible mercury contamination. Seventy-five percent showed detectable mercury, 35 percent showed greater than 0.5 ppm, and 2.7 percent (four birds) exceeded 5.0 parts per million in muscle tissue. On the hypothesis that feathers might provide a monitor of mercury levels in birds, a check for correlations between mercury in flesh and feathers was made on 48 of the test birds. Ninety one percent of the feather samples had mercury present if the corresponding muscle sample had mercury present. Seven feather samples had mercury present when the corresponding muscle sample showed no detectable mercury. Six birds were without detectable mercury in flesh or feathers. In 18 muscle samples exceeding 1.0 ppm mercury only one corresponding feather sample had a higher mercury concentration. Mercury levels in muscle appeared to cluster around three significantly different means: 0.276, 1.425, and 4.78 ppm. Corresponding mercury levels in feathers show greater variances that are associated with the lower levels of tissue mercury. (Author abstract by permission)

73-2841. Timofeyeva, O. A.; Shvartsman, G. A. (Moldava Sci. Res. Inst. Food Ind., USSR). **Vliyaniye konservirovaniya na ostatki geksakhlorbutadiena i geksakhlortsiklogeksana v soke i kompote. [The effect of preservation processes on the hexachlorobutadiene and BHC residue levels in fruit juices and stewed fruit.]** *Konserv. Ovoshchesush. Prom. 5: 32-34; 1973.* (2 references) (Russian)

The effects of washing, sterilization, and other preparative processes were studied on the hexachlorobutadiene residue level in grapes and grape juice and on the BHC (lindane) residue level in plums and plum juice. While washing with either hydrochloric acid or sodium hydroxide solution was not effective for removing γ-BHC from plums, washing with large amounts of water with intense aeration reduced the γ-BHC level by 30 to 40%. Sixty per cent of the γ-BHC level was removed by blanching at 85°C for 3 min. Washing with 55-60°C water at a ratio of 1:5 removed 60-70% of the hexachlorobutadiene residue content from grapes. Some 1 to 8% of the total hexachlorobutadiene residue present was found in grape juice. Sterilization of the grape juice with preliminary heating to 60°C in open air is highly effective for reducing the hexachlorobutadiene residue content.

73-2842. Simonffy, Z.; Horvath, F.; Takacs, J. (Central Lab., Vet. Insp. Service of the Meat Processing Ind., Budapest, Hungary). **Hus es huskeszitmenyek vizsgalata klorozott szenhidrogenek elofordulasara. [Examination of meat and meat products for occurrence of organochlorine compounds.]** *Magy. Allatorv. Lapja 28(3): 141-146; 1973.* (11 references) (Hungarian)

DDT, DDE, DDD, total DDT, lindane, α-BHC, β-BHC, δ-BHC, and total BHC residue contents were investigated by TLC and GLC in Hungarian meat and meat product samples, three beef samples from West Germany, four beef samples from France, one beef sample from the Netherlands, and three lard samples from the USSR. The DDT, DDE, DDD, total DDT, lindane, α-BHC, β-BHC, δ-BHC, and residue levels in the different meats and meat products were 0.02-0.46

mg/kg, 0.011-0.28 mg/kg, 0.012-0.058 mg/kg, 0.051-0.69 mg/kg, 0.011-0.11 mg/kg, 0.005-0.08 mg/kg, 0.005-0.06 mg/kg, and 0.005-0.0.04 mg/kg. The aldrin plus dieldrin residue levels in adipose tissue of swine and cattle, canned beef tongue, and canned ham were 0.02-0.04 mg/kg, 0.02-0.04 mg/kg, 0.03 mg/kg, and 0.01 mg/kg. Organochlorine pesticides did not accumulate in the liver. Pork muscle, liver, and fatty tissue samples contained more DDT and BHC than corresponding beef samples. The DDT and lindane residues were larger by about 10 and 5 times in adipose tissue than in muscles. Compared to thin-layer chromatography, the gas-chromatographic analysis proved quicker, more accurate, and less expensive.

73-2843. Kosmala, K. (Dept. Pharmacol. and Toxicol., Inst. of Vet. Med., Pulawy, Poland). **Pozostalosci pestycydow polichlorowych w tkance tluszczowej koni. [Residues of polychloro pesticides in the fat tissue of horses.]** *Med. Wet. 28(11): 684-685; 1972.* (7 references) (Polish)

DDE, DDD (TDE), and DDT and its metabolites were determined by gas chromatography in samples of perirenal adipose tissue from 87 ten—year-old horses from 11 different regions of Poland. The mean concentrations were: DDE, 0.112 ppm (+ 0.008); DDD, 0.039 ppm (+ 0.004); DDT, 0.422 ppm (+0.052); and DDT metabolites combined, 0.573 ppm (+0.063). These results are similar to those obtained previously from cow samples, 3 times lower than those from pigs, and 20 times lower than those from humans. The ratio of DDD:DDT was 1:4 in horses, 1:2 in pigs, and 2:1 in humans.

73-2844. Kuehnert, M.; Fuchs, V.; Golbs, S.; Knoll, U.; Eichelberger, P. (Sektion Tierproduction u. Veterinaermedizin, Karl Marx Univ., Leipzig, DDR). **Toxikologische Probleme von Rueckstaenden chemischer Verbindungen in Futtermitteln. 1. Mitt.: Vorkommen und Bedeutung von Rueckstaenden chemischer Verbindungen in Futtermitteln. [Toxicological problems emerging from residues of chemical compounds in feedstuffs. Part 1: Occurrence and importance of chemical residues in feedstuffs.]** *Monatsh. Veterinaermed. 27(22): 859-867; 1972.* (German)

Contamination of animal feed with chemical substances, especially pesticide residues, is discussed. The rates of elimination of organochlorine pesticides from milk decreased in the order heptachlor epoxide, aldrin, dieldrin, dicofol, endrin, lindane, DDT, heptachlor, toxaphene, chlordane, and methoxychlor. Organophosphorus pesticides, while being of high acute toxicity, are fairly rapidly metabolized in warm-blooded animals and do not tend to accumulate. Potato, wheat, and barley crops and eggs and meat from animals fed mercury-contaminated feed usually contained 0.05 ppm, 0.02 ppm, and 0.1 ppm of mercury even when proper doses of organomercuric pesticides were applied. Several cases of acute poisoning of animals with organomercuric pesticides have been reported. Plants treated with DNOC may contain several hundreds of ppm of this substance; doses over 5 ppm reduce weight increase of domestic animals. DNOC accumulates in the animal which makes feeding animals DNOC-contaminated forage unacceptable.

73-2845. Kuehnert, M.; Fuchs, V.; Golbs, S.; Knoll, U.; Eichelberger, P. (Sektion Tierproduktion und Veterinaermedizin, Karl Marx Univ., Leipzig, DDR). **Toxikologische Probleme von Rueckstaenden chemischer Verbindungen in Futtermitteln. 2. Mitt.: Massnahmen und Regelungen hinsichtlich toxischer Schadverbindungen in Futtermitteln zur Sicherung der tierischen Produktion und zum Schutze der menschlichen Gesundheit. [Toxicological problems relating to residues of chemical compounds in feedstuffs. Part 2: Action and rules regarding toxic compounds in feedstuffs with the view to safeguarding animal production and protecting human health.]** *Monatsh. Veterinaermed. 28(2): 41-45; 1973.* (80 references) (German)

Tolerance levels proposed for pesticide residues and other contaminants in foods and feeds in the USSR, Poland, Hungary, and Czechoslovakia are presented; methods for reducing pesticide residue levels are described. Feed tolerance levels may guarantee compliance with food tolerance levels. Steaming alfalfa products effectively reduced DDT and endrin residues by 86 and 93% respectively. The organochlorine pesticide residue level in poultry can be effectively reduced by feeding poultry protein-rich feed after a 48-hr fast. Administration of thyroprotein to dairy cows increased elimination of organochlorine pesticides via milk, but did not affect fat'depot residues. Feeding small quantities of activated carbon to dairy cows resulted in increased residue elimination in both feces and urine.

73-2846. Nawa, H. (Sch. of Prof. Hiraki's Intern. Med., Fac. of Med., Okayama Univ., Okayama, Japan). **[Studies on intoxication by organochlorine pesticides for agricultural use. Part 2. Examination of concentration of organochlorine pesticides in sera of healthy people and of patients with various diseases.]** *Okayama Igakkai Zasshi (J. Okayama Med. Soc.) 85(1-2): 47-58; 1973.* (55 references) (Japanese)

The determination of organochlorine pesticides and some of their metabolites in sera of healthy persons and patients with various diseases was carried out by GLC with ECD. In all 96 cases β-BHC, *p,p'*-DDT, and *p,p'*-DDE were detected. In 37 healthy persons 0-0.0020 ppm α-BHC, 0.0030-0.0390 ppm β-BHC, 0-0.0050 ppm γ-BHC, 0.0020-0.0215 ppm *p,p'*-DDE, 0.0020-0.0197 ppm *p,p'*-DDT, and 0-0.0031 ppm dieldrin were detected with no differences between sexes, ages, and occupations. The average value of β-BHC was relatively higher in patients with hepatic diseases, SMON (subacute

myelo-optic neuropathy), leukemia, or malignant tumors. In sera of patients with malignant tumors the concentrations of β-BHC, *p,p'*-DDT, and *p,p'*-DDE were higher than those of healthy persons and of patients with other diseases. The concentrations of β-BHC, *p,p'*-DDT, and *p,p'*-DDE in patients with kidney disease and aplastic anemia (also three other blood diseases) were relatively lower than those of healthy persons and patients with other diseases. A high concentration of *p,p'*-DDE occurred in sera of two patients with hepatic diseases. Some considerations on these findings are discussed.

73-2847. Osaka Prefect. Project Team of Planning for Preventing Environ. Pollution and Nuisance (Osaka, Japan). **[The countermeasures for damages due to agricultural pesticides. 2nd Item of 1st Clause of Chapter XII, A Draft of the Plan of Environment Administration.]** *Osaka-Fu Kankyo Kanri Keikaku-Ka (A Draft for Environmental Protection Programs: Pesticide Control) Osaka Prefect. Govt., Chapter 12, Section 1, 1973, p. 392-395.* (Japanese)

β-BHC in cow milk and dairy products, BHC and DDT in unpolished rice, isomers of BHC, DDT, aldrin, and dieldrin in mother's milk and in the fats in mother's milk were detected. The concentration of β-BHC in cow milk has gradually decreased from March 1970 (0.339 ppm) to Jan. 1971 (0.134 ppm) to Jan. 1972 (0.023). The residual concentration of total BHC and total DDT during the survey in 1971 was 0.0059 ppm total BHC and 0.0004 ppm of total DDT. The residual concentration of α-, β-, γ- and δ-BHC, total DDT, aldrin and dieldrin in mother's milk in 1971 averaged 0.002, 0.159, 0.0005, 0.0001, 0.021, not detected, and 0.001 ppm, respectively; in 1972 the values were 0.002, 0.176, 0.002, trace, 0.043, not detected, and 0.002 ppm. The residual concentration of the above mentioned pesticides in the fats of mother's milk in 1972 averaged 0.069, 5.184, 0.062, trace, 2.811, not detected, and 0.080 ppm.

73-2848. Brown, N. P. H.; Furmidge, C. G. L.; Grayson, B. T. (Shell Res. Ltd., Woodstock Agr. Res. Cent., Sittingbourne, Kent, England). **Hydrolysis of the triazine herbicide, cyanazine.** *Pestic. Sci. 3(6): 669-678; 1973.* (4 references)

The hydrolysis of cyanazine has been studied using ^{14}C-ring labeled compound over a temperature range of 25° to 75°C and over a range of pH values from 1.5 to 12. The activation energies and the activation entropy changes during hydrolysis showed there was a different mechanism under acid and alkaline conditions. The only product identified after hydrolysis in acid solutions was 2-hydroxy-4-carboxyisopropylamino-1,3,5-triazine. In alkaline solution the same hydroxy-acid was the end-product, but 2-chloro-4-amidoisopropylamino-6-ethylamino-1,3,5-triazine was isolated as an intermediate. The variation of the specific rate constants with temperature for hydrolytic catalysis by H^+, OH^- was determined, thus enabling the hydrolytic half-life of cyanazine to be calculated at any pH and temperature. (Author abstract by permission)

73-2849. Beynon, K. I.; Wright, A. N.; Bosio, P.; McGill, A. E. J.; Robinson, J. (Shell Res. Ltd., Woodstock Agr. Res. Cent., Sittingbourne, Kent, England). **The fate of the molluscicide *N*-tritylmorpholine following its use on pastures for the control of liver fluke.** *Pestic. Sci. 3(6): 689-703; 1973.* (12 references)

The molluscicide *N*-tritylmorpholine (Frescon, trifenmorph) is used for the control of the intermediate snail hosts of fascioliasis in livestock. Laboratory and field studies have been undertaken to establish the fate of the compound following its use on pasture. Radiochemical techniques have been used under laboratory conditions to identify the potential degradation products. The major one has been shown to be triphenylcarbinol. Triphenylcarbinol was detected on pastures treated at 0.4 to 0.5 kg/ha under practical conditions, but the residues of it and of the parent molluscicide were generally below 0.3 mg/kg within 8 weeks of the application. On the pasture grass half of the initial deposit of *N*-tritylmorpholine was lost within 1 to 3 weeks, and on soils it was lost within 1 to 4 weeks. Residues could not be detected in the tissues of sheep feeding on the treated pasture. While small residues (0.023 mg/kg or less) were detected in the milk of some cows feeding on the pasture soon after application they were absent (below 0.002 mg/kg) in the milk at 10 days or more from treatment. (Author abstract by permission)

73-2850. Osgerby, J. M. (Shell Res. Ltd., Woodstock Agr. Res. Cent., Sittingbourne, Kent, England). **An assessment of the consequences of the controlled release of pesticides from granular formulations.** *Pestic. Sci. 3(6): 753-769; 1973.* (5 references)

The value of an analytical approach to the assessment of the advantages resulting from the use of controlled release granular formulations of pesticides is discussed. The methods are illustrated by considering the concentration-time profiles resulting from the application of such formulations to water and to soils. The importance of the particular environment in which these formulations are used and of the dynamic nature of the pest population is emphasized. It is concluded that relatively simple controlled release granular formulations could give improvements in the performance of pesticides compared with conventional formulations but that the practicality of producing such formulations with a sufficiently large range of release rate constants is uncertain. Equally, their use under field conditions might be subject to practical difficulties. (Author abstract by permission)

73-2851. Ahmed, N.; Morrison, F. O. (Dept. Entomol., Macdonald College, Quebec, Canada). **Longevity of residues of four organophosphate insecticides in soil.** *Phytoprotection 53(2-3): 71-74; 1972.* (3 references)

The active ingredient in granular formulations of chlorfenvinphos, fensulfothion, diazinon, and dyfonate added to Chicot sandy loam soil in microplots disappeared more rapidly in the field than in the greenhouse. Persistence of the residues, measured by the mortality of *Euxesta notata* larvae exposed to the treated soil, was greatest for dyfonate and less for diazinon, fensulfothion, and chlorfenvinphos in that order. At 6 lbs/A dyfonate persisted for 28 weeks in the field and for 17 weeks in the greenhouse while chlorfenvinphos was detectable for 5 weeks and 3 weeks under the respective conditions. Differences in test organisms may account for some differences in the order of persistence, found when results are compared with previously published reports, but in all cases the organophosphates seem to be more persistent in the greenhouse.

73-2852. Komar, M. (Dept. Food Hyg., Vet. College, 6100 Ljubljana, Yugoslavia). **Residues of organochlorine pesticides in samples of milk produced in Slovenia.** *Vet. Arh. 42(7-8): 209-212; 1972.* (6 references)

Analysis of milk samples from eight regions in Northern Yugoslavia revealed a high prevalence of DDT and α-BHC residues. Concentrations of total DDT ranged from 0.0002 to 0.0590 ppm, and more than 74.3% of the samples contained > 0.005 ppm. Only 4.4% of the samples contained > 0.005 ppm α-BHC. In 28.3% of the samples γ-BHC was not detected, and a concentration > 0.005 ppm was only found in 6%. Dieldrin was detectable in only 47% of the samples and only exceeded 0.003 ppm in 1.2% of the cases. The use of DDT and α-BHC has been prohibited in Yugoslavia since the results of the analyses were reported.

73-2853. Hamilton, K. C.; Arle, H. F. (Arizona Agr. Exp. Sta., Tucson, AZ 85721). **Persistence of herbicides in fallow desert cropland.** *Weed Sci. 20(6): 573-576; 1972.* (28 references)

Four herbicides were applied at 6-month intervals, and incorporated by disking, to desert cropland soils at two locations. Trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine) was applied at 0.9 kg/ha; and 2,4-bis(isopropylamino)-6-(methylthio)-*s*-triazine (prometryne), 2-chloro-4-(ethylamino)-6-(isopropylamino)-*s* triazine (atrazine), and 3-(3,4-dichlorophenyl)-1,1-dimethylurea (diuron) were applied at 1.8 kg/ha. Following treatment the soils remained fallow without irrigation for 24, 18, 12, 6, or 0 months before planting eight crops. Sugarbeet (*Beta vulgaris* L.) growth was affected 24 months after applications of trifluralin. Growth of two or three crops at each location was affected 18 months after application of prometryne. Residues of atrazine and diuron usually caused greater injury to most crops than did prometryne or trifluralin. Six months after the first planting four additional crops were planted. In plots planted 30 months after treatment diuron reduced sorghum (*Sorghum bicolor* (L.) *Moench*) stands by 70% and reduced fresh weights of three crops at Mesa. Trifluralin reduced fresh weight of sorghum by 80% at Yuma. Crops responded differently to herbici'e residues at the two locations. Injury to crops was most severe at Mesa despite higher rainfall during the fallow period at this location. (Author abstract by permission)

See also 73-2799 73-2800 73-2801 73-2805 73-2868 73-2912

73-2854. Oden, T. (Bocek Toksikol. Lab., Zirai Mucadele Ilac Aletleri Ents., Ankara, Turkey). **Pestisid'lerin kuslara etkisi. [Effects of pesticides on birds.]** *Bitki Koruma Bull. 11(4): 247-270; 1971.* (83 references) (Turkish)

Literature on the effects of pesticides on birds is reviewed. Effects reported ranged from acute, often fatal intoxication through chronic poisoning (including reproductive impairment) to residues in tissues of asymptomatic birds. Poisoning of birds has been reported after application of DDT, Zectran (mexacarb), dieldrin, and heptachlor. Populations of skylark (*Alauda arvensis*), sparrow hawk (*Accipiter nisus*), kestrel (*Falco tinnunculus*), peregrine (*Falco peregrinus*), buzzard (*Buteo buteo*), kite (*Milvus*), and hoopoe (*Upupa epops*) in Turkey are assumed to have been affected by pesticide use. Many dead birds of these species were found in fields treated with pesticides. (From author abstract)

73-2855. Hearn, C. E. D. (Gillette International, London, England). **A review of agricultural pesticide incidents in man in England and Wales, 1952-1971.** *Brit. J. Ind. Med. 30(3): 253-258; 1973.* (6 references)

Since the passage of the Agriculture Act (England) in 1952, fatal poisonings connected with agricultural chemicals have been reduced, incidents involving organophosphates have remained the same, and public awareness of the problem of pesticide poisoning has increased. Nine fatal poisonings were reported during that period; three were due to occupational exposure to an organomercury compound, arsenic, and an organophosphate. Illegal transfer of pesticides to unlabeled containers and storage of containers in places accessible to children were responsible for most of the other fatalities. About one half of the 250 toxic effects reported were systemic, and eye injuries and dermatitis accounted for most of the remaining effects. Of the 121 cases of nonfatal systemic poisoning, 34 were attributed to organophosphates, 26 to one incident involving chloropicrin, 15 to arsenites, 8 to dinitro compounds, 3 to nicotine, 2 to fungicides, and 1 each to cyanide and organomercury.

73-2856. Matsueda, S.; Tsukada, N.; Uchiyama, M.; Kudo, N. (Fac. of Gen. Educ. (Science), Hirosaki Univ., Hirosaki, Japan). **[The relationship between the cholinesterase activity and level of glutathione in human blood of the organophosphorus pesticide exposed persons during the season when no pesticides are applied.]** *Eisei Kagaku (J. Hyg. Chem.) 19(4): 215-218; 1973.* (11 references) (Japanese)

Serum and erythrocyte cholinesterase activities were determined in persons exposed to organophosphorus pesticides six months after seasonal application. Ninety percent of those tested had been exposed to methyl parathion for more than 10 years and were over 30 years old. A conspicuous difference was detected in both average values (0.064 ± 0.03 and 0.41 ± 0.04) and those of normal healthy persons (0.91 ± 0.03 and 0.65 ± 0.10). However, there was no difference in total blood GSH value. When 300 mg of GSH was administered to the exposed persons daily p.o. for four weeks, the serum and erythrocyte cholinesterase activities increased almost to normal values. When administration was stopped, the values decreased to the former (inhibited) values.

73-2857. Chawla, S. C.; Mehta, S. P. (Maulana Azad Med. College, New Delhi, India). **A study of host and environment factors in cases of accidental poisoning admitted in Irwin Hospital.** *Indian J. Med. Res. 61(5): 724-731; 1973.* (8 references)

The roles of host, agent, and environmental factors were studied in 113 cases of poisoning treated at Irwin Hospital, New Delhi, between September 1969 and May 1970. Pesticides were responsible for about 34% of the admissions. The most common cause of accidental poisoning was copper sulfate; poisoning by this agent was most frequently observed in males and in those 15-24 years old. There were also four cases of poisoning by Tik-20, three by parathion, one by DDT, and one by rat poison. Measures which would reduce such poisonings include: control of the sale of copper sulfate; education of housewives in the storage of toxic household products; and education of workers in industries in use of protective clothing, proper storage of chemicals, and use of washing facilities.

73-2858. Singh, B. P.; Thakur, D. K. (Ranchi Vet. College, Ranchi-12, India). **Gammexane poisoning in a calf.** *Indian Vet. J. 50(4): 369-370; 1973.* (3 references)

A bull calf became intoxicated about three hours after gammexane (lindane) was applied over the body for treatment of ectoparasites. Diagnosis of lindane poisoning was made on the basis of the case history and pupilary dilatation, piloerection, and vacant look. Symptoms included excitability, salivation, grinding of teeth, dyspnea, and severe convulsions. The calf was treated with calcium borogluconate, thiopental sodium, and chloral hydrate, and recovered in about 24 hours.

73-2859. Freeman, J. I.; Hines, M. P. (N. Carolina State Board of Health, Raleigh, NC 27602). **Epidemiology of pesticide poisoning in North Carolina.** *J. Amer. Vet. Med. Ass. 161(11): 1492-1494; 1972.* (5 references)

One of the most important factors in pesticide poisoning epidemiology in N. Carolina is widespread improper handling of pesticides. Bad habits developed because of the low toxicity of the organochlorines, the first compounds to be used extensively. When organophosphates were substituted for the organochlorines, the amount and degree of individual exposure remained fairly constant, but the toxicity increased, and higher morbidity and mortality resulted. Accessibility, another

factor, especially to children, is usually due to negligence of the parents who do not store chemicals in locked areas. Pesticides are offered for sale over-the-counter to adults with little regard for the person's ability to read or comprehend the label message. Organophosphates are the leading cause of pesticide mortality in N. Carolina, and patients require hospitalization. Poisonings due to other compounds are often treated on an out-patient basis. Agricultural organizations must take the lead in educating farmers in the correct use of pesticides.

73-2860. Peters, P. L. (Arkansas State Dept. Health, Bur. Environ. Health Serv., Little Rock, AR). **Pesticides project. Replacement of DDT with toxic insecticides.** *J. Arkansas Med. Soc. 69(11): 367-368; 1973.*

Methyl parathion, expected to be the primary substitute for DDT on cotton and soybeans in Arkansas, is highly toxic and must be handled with more care than DDT. Death can result from absorption of approximately 20 mg (adult) through the oral, respiratory, or dermal route within several hours unless treatment is initiated. Parasympathetic effects such as anorexia, nausea, sweating, tightness in chest, diarrhea, salivation, profuse sweating, and, in severe cases, involuntary defecation and urination, and pulmonary edema appear first. Muscle twitching, fasciculations and cramps, followed by weakness, ataxia, and paralysis appear after parasympathetic effects have reached moderate severity; central nervous system effects may be observed. Atropine should be administered as soon as cyanosis is overcome, and atropinization should be maintained. Pralidoxime may be given in addition, but not in place of atropine. Further pesticide exposure should be prevented by gastric lavage, removal of clothing, and cleansing of skin, for which rubber gloves must be worn.

73-2861. Wadia, R. S.; Ichaporia, R. N.; Karnik, V. M.; Relwani, G. S.; Grant, K. B. (Author address not given). **Cholinesterase levels in diazinon poisoning and after atropine treatment.** *J. Indian Med. Ass. 59(6): 234-238; 1972.* (8 references)

In in vitro experiments diazinon caused an immediate 80% inactivation of serum ChE at a concentration of 0.0005%. Atropine had no effect on the maximum inactivation of ChE, and pralidoxime had only a slight effect. In 17 cases of mild or moderate diazinon poisoning ChE levels were rapidly depressed and did not rise for the first 24-48 hr. Fasciculations were the only clinical finding upon admission which correlated with serum ChE levels. Relapses were not necessarily associated with further reductions in the enzyme activity. It is known that the clinical picture of poisoning is not due to serum ChE depression, but that this is a diagnostic tool which reflects the levels of RBC ChE. Experience has indicated that atropine is sufficient for treatment of mild and moderate cases of poisoning, but relapses must be handled with addition of pralidoxime. Atropine toxicity was believed to result when ChE levels were higher than generally associated with symptoms present.

73-2862. Cooper, W. C. (Tabershaw-Cooper Ass., Inc., Berkeley, CA 94704). **Indicators of susceptibility to industrial chemicals.** *J. Occup. Med. 15(4): 355-359; 1973.* (34 references)

It has not been considered necessary to screen pesticide workers for genetic pseudocholinesterase deficiency since no function has been found for this enzyme. However, from 2.5% to 4% of the population may be affected by it. During a California study no correlation was observed between heterozygotes for the genetic trait and their reaction to organophosphate poisoning. A study of atypical ChE variants would be of more value as an anthropological and genetic tool than as a protective device for workers. With the present limited knowledge in this field, employers should not be expected to screen for any of the genetic disorders which might affect response to environmental chemicals.

73-2863. Miller, M. J. (Dept. Tropical Med. Parasitol., Tulane Univ., New Orleans, LA 70112). **Industrialization, ecology and health in the tropics.** *J. Occup. Med. 15(4): 365-368; 1973.* (16 references)

Insecticide poisoning is one of the health problems increasing as agriculture is industrialized in the tropics. In Ghana recently maize, sprayed with a mercury-based pesticide instead of the usual DDT, was sold to residents of one village; the entire village population became ill, and about 25% died of mercury poisoning. Increases in crop pests were observed after use of DDT on cotton and cocoa in Peru and Malaya; these were reversed when use of the pesticide was discontinued.

73-2864. Vostal, J. J.; Clarkson, T. W. (Univ. Rochester School Med. Dentistry, Rochester, NY 14642). **Mercury as an environmental hazard.** *J. Occup. Med. 15(8): 649-656; 1973.* (61 references)

A complex set of factors determine the degree to which mercury can be considered an environmental hazard. Agriculture has contributed only a small percentage to the release of mercury into the environment, but the main chemical forms of mercury used in agriculture, the short-chain alkyl mercurials, are quite toxic, readily absorbed, and stable. Mass poisonings have been reported in several countries due to contamination of grain and meat products by mercurial fungicides. Discontinuation of the use of these forms of mercury in U.S. agriculture has led to a general decline in the distribution of mercury through this source. A proposal has been made by an expert committee that the maximum tolerable level of daily exposure to methyl mercury be 30 μg. Little information is available on the dose response relationship in man and on the interaction of methyl mercury with other dietary constituents, but it is

generally agreed that the frequently irreversible nature of its effects makes it a greater potential hazard to man than any other form of mercury.

73-2865. Mullick, F. G.; Drake, R. M.; Irey, N. S. (Armed Forces Inst. Pathol., Washington, DC 20305). **Adverse reactions to drugs: a clinicopathologic survey of 200 infants and children.** *J. Pediatrics 82(3): 506-510; 1973.*(15 references)

Insecticides were among the most frequently encountered causes of adverse drug reactions in a survey of 200 pediatric cases. Eight different insecticides were involved. About 50% of the cases were children under five years of age, and 23.5% of the cases were due to nontherapeutic exposure to insecticides, etcetera. The most frequent routes of exposure in decreasing order were: oral, placental transfer, injection, and inhalation.

73-2866. Schulz, O.; Kirchner, K. (Inst. Veterinaermed. Bezirkes Neubrandenburg, Neubrandenburg, DDR). **Vergiftungsfaelle im Bezirk Neubrandenburg und Schlussfolgerungen fuer die Prophylaxe. [Cases of intoxication in Neubrandenburg County and conclusions for prophylaxis.]** *Monatsh. Veterinaermed. 27(22): 872-875; 1972.* (8 references) (German)

Poisonings of domestic animals from pesticides and other chemicals, as reported from Neubrandenburg County, East Germany, are reviewed. Lethal poisonings of cattle due to ingestion of lindane-contaminated feed, with such symptoms as tonic-clonic spasms, excitation, and rhinorrhea were reported. The feed contained 10,000 ppm of lindane. Fatal poisonings due to trichlorfon used for fly control in stables, poisonings of poultry with rodenticides, and fatal poisoning of calves due to ingestion of organomercuric pesticide-treated linseed were encountered.

73-2867. Gerisch, V.; Calsow, P.; Schlegelmilch, R. (Inst. f. Veterinaerwesen d. Bezirkes Erfurt, Bad Langensalza, DDR). **Beobachtungen zur chronischen Toxizitaet von Warfarin fuer Broilerkueken. [Observations on chronic toxicity of warfarin to broiler chicks.]** *Monatsh. Veterinaermed. 28(2): 51-54; 1973.* (7 references) (German)

A case of chronic warfarin poisoning in a deep-litter broiler chicken fattening facility from the use of warfarin for rodent control and a chronic poisoning test on broiler chickens are described. Increased death rates of 8-12% prompted pathological investigations which evidenced inflammatory and necrotic, focal chages in the hepatic tissues; degenerative changes in the liver and myocardium; hemorrhages in the gastrointestinal walls, skeletal muscules, and kidney; and subepicardial hemorrhages in the heart against the general background of parasitic and microbial attacks. Chickens fed 210 to 1,680 mg of warfarin per kg of feed for several weeks developed similar symptoms of which hemorrhages in the limbs, muscles, and abdominal cavity were most conspicuous. Warfarin was detected in liver samples. The reduction of both the hematocrit value and of the hemoglobin concentration was due to hemorrhages; the prolonged prothrombin time indicates the direct action of warfarin on the hepatic synthesis of clotting factors.

73-2868. Haselein, I.; Graubmann, H. D.; Schulz, W. (Inst. fuer Veterinaerwesen des Bezirkes Schwerin, Schwerin-Neumehle, DDR). **Quecksilbervergiftungen und Rueckstandsbildungen in Lebensmitteln bei Verfuetterung gebeizten Saatgutes an Schweine. [Mercury intoxications and residues in foodstuffs after feeding of dressed seeds to pigs.]** *Monatsh. Veterinaermed. 28(2): 54-56; 1973.* (8 references) (German)

The accidental poisoning of pigs with rye dressed with an organomercury compound two years previously is described. Mercury residue levels in deceased and emergency-slaughtered animals and in meat products are presented. The pigs fed daily 500 to 1,000 g of dressed rye for 4-10 weeks developed typical poisoning symptoms such as blindness, staggering gait, pronounced focal hemorrhages in the liver, chronic inflammation of the gastric mucosa, inflammation of the urinary bladder, pathologic alteration of the kidney, and pulmonary hyperemia. The mercury levels in the livers and kidneys from deceased and emergency-slaughtered animals were 0.5-2 ppm and 10 ppm, respectively. Sausage and meat from such pigs contained 0.13-1.7 ppm and 0.2-2.5 ppm of mercury.

73-2869. Neumann, G.; Heidrich, R.; Einhorn, K. (Inst. fuer Veterinaerwesen des Bezirkes Frankfurt (Oder), Frankfurt/O., DDR). **Lindanvergiftungen in einem Kaelbermastbestand. [Lindane intoxication in a facility for fattening calves.]** *Monatsh. Veterinaermed. 28(2): 56-59; 1973.* (8 references) (German)

Subacute and acute poisoning of 65 calves and finishing cattle (of which 38 died) after oral intake of lindane-contaminated feed is reported. Symptoms included tremor, sialorrhea, dilated pupils, tachypnea, tachycardia, motor disorders, and sometimes opisthotonus. Convulsions, which recurred up to five times in larger animals, caused death in young calves. Autopsy revealed pale, friable skeletal muscles; subepicardial and epicardial hemorrhages; pulmonary congestion; moderately edematous, soft liver; very soft kidney with slight cortical hemorrhages; and diffuse reddening of the mucosa of the small intestine. Histological investigations evidenced mostly granulous, focal degeneration of the myocardium, capillary hyperemia of the lung and liver, vacuolation of the kidney sometimes with necrosis of the epithelium, catarrhal duodenitis with widespread desquamation of the mucous epithelium, and one case of vacuolation of the cerebral cortex with venous and capillary plethora. The lindane concentrations in the liver,

gastric content, and in the bran fed to the animals were 8-20 ppm, 40-120 ppm, and 50-1,800 ppm. The lindane residue content in the liver of a bull slaughtered after recovery was 6 ppm.

73-2870. Neilands, J. B. (Univ. California, Dept. Biochem., Berkeley, CA). **Survey of chemical and related weapons of war.** *Naturwissenschaften 60: 177-183; 1973.* (29 references)

The use of chemical pesticides in warfare probably began in 1961 when herbicides were employed to defoliate areas of S. Vietnam. Agent Orange, the primary defoliant, is a mixture of 2,4-D and 2,4,5-T and was used until 1970, when it was shown highly teratogenic. A 5-fold increase in the incidence of primary hepatoma in heavily defoliated areas of S. Vietnam was believed caused by residues of tetrachlorodioxin in the mixture. Agent White, a mixture of 2,4-D and picloram and substituted for Agent Orange, retains its phytotoxicity in soil for decades. Organophosphates have also been produced for warfare although their use has not often been documented. These compounds attack the active center of AChE, causing an accumulation of ACh and a consequent paralysis of voluntary and involuntary muscles; concentrations of as little as 0.01 mg per m^3 of air are almost instantly fatal. They are rapidly hydrolyzed in alkaline solution, and poisoning can be treated by simultaneous administration of atropine and pralidoxime.

73-2871. Ikuta, S. (Dept. Intern. Med., Suto Gen. Hosp., Yanai, Japan). **[A case of acute intoxication by an organophosphorus pesticide.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural. Med.) 22(2): 113; 1973.* (Japanese)

An 81-year-old farmer attempted suicide by swallowing 65 ml of 50% EC of trichlorfon and was hospitalized. Symptoms included coma, absence of pyrexia, pulse rate 92, blood pressure 122-80 mm Hg, normal eye conjunctiva, conspicuous miosis, normal pharynx and tonsils, and white coating on the tongue. Proteinuria and occult bleeding occurred but disappeared. Blood studies showed hemoglobin was 79% with an RBC of 3.45 million and a WBC of 12,400. Chest roentgenogram showed increased pulmonary markings and cardiac hypertrophy; ECG showed lower potential of limb induction and afterwards an extrasystole of the upper ventricle. Liver function, electrolytes, blood sugar after fasting, spinal fluid and EEG were normal, with a CPK of 10. Two ampules of PAM i.v. and one ampule of atropine sulfate i.m. were administered every quarter hour with oxygen therapy and glucose. Gastric lavage was repeated until the odor of the pesticide disappeared. After 12 ampules of PAM and 6 ampules of atropine sulfate had been given, mydriasis and light reflex were observed. The patient became conscious approximately four hours after hospitalization, but went into shock for 8 hours about 13 hours after hospitalization. Hallucinations developed on the third day with serious excitation, but disappeared after the 22nd day. After the 27th day a disturbance of gait, muscle atrophy of both lower limbs, weakness of knee and ankle reflexes, and hypoesthesia of the feet developed and was diagnosed as polyneuropathy. Serum cholinesterase activity was at first zero then slowly increased and plateaued after the 29th day.

73-2872. Konishi, Y.; Sugimura, I.; Ukawa, S.; Iida, K. (Asahikawa Kosei Hosp., Asahikawa, Japan). **[On the results of health examination of the pesticide applicators, especially on their anemia.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(2): 123; 1973.* (Japanese)

The tendency of hemoglobin values to decrease during the busy farming season was studied. An examination was carried out on pesticide applicators with emphasis on iron metabolism. The serum and erythrocyte cholinesterase activities just after pesticide application were significantly lowered in 27 persons directly engaging in pesticide application in the fields of the district. Pesticide effects on the liver appeared as decreased albumin values and increased GPT values. A negative correlation of 0.24% occurred between the serum iron and serum transferrin values after application. The negative correlation was considered as an iron-deficiency type. Whether this change is due to the direct effect of the pesticide or is a nutritive problem needs studying.

73-2873. Kondo, K.; Korokuma, M.; Takahashi, K. (Obihiro Kosei Hospital, Japan). **[A case of acute intoxication by a pesticide.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(2): 123; 1973.* (Japanese)

A 40-year-old farmer attempted suicide by swallowing about 30 ml of 50% fenthion EC. He was hospitalized one hour later with conspicuous miosis, sweating, stridor, and convulsion of muscles of lower extremities. Atropine sulfate administered in large quantities (62 ampules in 12 days) with 6 ampules of PAM proved effective treatment; the patient became fully conscious after four days, and miosis and subjective symptoms disappeared. Serum cholinesterase activity (0.02ΔpH at hospitalization) gradually increased with the treatment. The patient was discharged 25 days after hospitalization with normal function of the liver and kidneys. Contributing factors to recovery included early discovery, gastric lavage, and no complications from pulmonary edema.

73-2874. Smith, I. A.; Boyd, J. H. (146 Commercial St., Kirkcaldy, Fife, Scotland). **Another case of poisoning by alphachloralose.** *Vet. Rec. 91(26): 662; 1972.*

A case of poisoning by alpha chloralose which resembled a previously reported poisoning by a new

rodenticide was presented in a Letter-to-the-Editor. The dog which had ingested about one-fourth lb of a mixture of blue granules (identified as Alphakil) in barleymeal exhibited symptoms about 6 to 7 hours after ingestion. Lethargy and ataxia were observed, but not diarrhea. Methylamphetamine was injected intravenously, and heat and external stimuli were used as supportive therapy. The dog showed marked interest in her surroundings within two hours and was normal within five hours. As suggested in the previous report, more comprehensive and up-to-date literature on new rodenticides should be made available.

73-2875. Vikshraytis, Ch. Yu.; Moteyunene, N. P. (Sci. Res. Inst. Oncol., Min. Pub. Health of the Lithuanian SSR, Vilnyus, USSR). **Kol'poskopicheskoye vyyavleniye predraka sheyki matki i zhenshchin, rabotayushchikh s nekotorymi promyshlennymi yadami. [Colposcopic recognition of the cervical precancer in females working with certain industrial poisons.]** *Vop. Onkol. 18: 41-45; 1972.* (26 references) (Russian)

The incidence of dyskeratosis of the mucous membrane, transformation zones, and polyposis—all manifestations of precancerous states of the cervix uteri—was studied in 557 female dentists occupationally exposed to mercury vapor; 393 female pharmacists exposed to ammonia vapor; 119 female solderers exposed to lead, petroleum distillates, and carbon monoxide; and another 35 female factory workers exposed to airborne thiram concentrations of 1.24 to 5.95 mg/m^3. Precancerous lesions were detected in 18.3% of the females working with poisonous substances. The corresponding incidence in a control group of 262 females was 5.3%. The incidence of precancerous changes in the women exposed to thiram was 11.4±5.4%. In the same group, the incidences of dyskeratosis of the mucous membrane and of polyposis were 8.5±4.7% and 22.8±2.7% respectively. Occurrence of transformation zones was not detected.

73-2876. Babchina, I. P. (Dept. Neuropathol, First I. P. Pavlov Leningrad Med. Inst., Leningrad, USSR). **Porazheniye nervnoy sistemy pri otravlenii khlorofosom. [Nervous system damage in trichlorfon poisoning.]** *Vrach. Delo 2: 137-139; 1972.* (Russian)

Three cases of accidental and intentional trichlorfon poisoning are described. The subsequent development of polyneuritis in two cases and of toxic delirious psychosis in another case are followed. Polyneuritis and toxic delirious psychosis, supported in two cases by chronic alcoholism, developed a few days to several weeks after recovery from acute poisoning with trichlorfon and persisted for some time. Polyneuritis was manifested by pains in the shoulders, paresis and paralysis of the lower extremities especially, reduction of tactile sensitivity, absence of periosteal and some other reflexes, diffuse muscular dystrophy, weakness of the limbs, and cyanosis. Electromyographic investigations revealed reductions in wave frequency and amplitude, spontaneous denervational activity, and the presence of fibrillary potentials.

73-2877. Semenov, I. A.; Palamarchuk, Ye. S.; Mudritskiy, V. D.; Yaroshchuk, G. S. (October Revolution Kalinin Hosp., Kalinin, USSR). **Neotlozhnaya pomoshch' pri ostrom otravlenii fosfororganicheskimi soyedineniyami. [Emergency aid in acute poisoning with organophosphorus compounds.]** *Vrach. Delo 10: 131-134; 1972.* (10 references) (Russian)

Emergency measures used in 112 cases of mostly accidental poisonings with organophosphate compounds such as trichlorfon, thiophos (parathion), and carbofos (malathion) are reported. Poisoning was due to inhalation of vapors in 39 cases (mild to moderately serious); another 73 cases were due to ingestion of pesticides. Gastric lavage with water or 2% soda solution and charcoal administration were used when pesticides were ingested. Atropine was administered s.c., i.m., or i.v. in all cases. The total atropine dose administered during the first day after hospitalization amounted to 2 to 20 mg, depending on the severity of the cases. Glucose and a vitamin B complex were also administered and resuscitative measures taken. Complete recovery in 84, complications in the form of pneumonia, psychoses, and polyneuritis in 23, and death in 5 cases occurred.

73-2878. Kazakevich, R. L.; Parkhomov, A. A.; Gorenshteyn, G. S. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polymers, Plastic Materials, Kiev, USSR). **Ob oslozhneniyakh posle ostrogo otravleniya khlorofosom. [On complications occurring following acute poisoning with trichlorfon.]** *Vrach. Delo 10: 134-136; 1972.* (Russian)

Serious myeloradiculopolyneuritis developed as a sequel to acute, intentional poisoning with trichlorfon in a 23-year-old female. Cyanosis, miosis, absence of corneal reflexes, coma, increased pulse rate, and acute respiratory insufficiency were the principal symptoms of poisoning. Atropine, Ringer solution, and intubation were applied following gastric lavage with magnesium sulfate. Pains in the limbs, asthenia of the fingers, pronounced tactile hypersensitivity, hyperpathia, and reduced reflex activity of the limbs developed after the 21st day of poisoning. Predominant affection of the myelin membrane and of the axial cylinders of the peripheral nerves due to acute poisoning with trichlorfon was established experimentally.

73-2879. Petrova, N. I.; Kogan, Ye. M.; Botsyurko, V. I.; Krekhovetskiy, Z. S. (Med. Sanit. Dept., Burshtin Area Power Plant, Ivano-Frankovsk Region, USSR). **Ostroye otravleniye kholorofosom, oslozhnennoye polinevritom. [Acute trichlorfon poisoning, complicated**

by polyneuritis.] *Vrach. Delo 12: 114-115; 1972.* (Russian)

Acute poisoning with subsequent polyneuritis in a 30-year-old male due to accidental ingestion of trichlorfon during intoxication is described. Basic symptoms included unconsciousness, paleness of the skin, nausea, emesis, strongly reduced reflex activity, miosis, vesicular respiration, and epigastric pain. Treatment with glucose, vitamins B1 and B6, and with repeated doses of atropine was successful. Slight horizontal nystagmus, reduced activity of the Achilles tendon and tendon reflexes, pains, paresis, and slight hyperesthesia of the lower limbs with positive Lasegue's symptom and Barre's symptom developed later. A potentiating effect of alcohol is possible.

See also 73-2804 73-2805 73-2807 73-2808 73-2810 73-2933 73-2960 73-2976 73-3021

73-2880. Hennighausen, G.; Wiegershausen, B. (Inst. Pharmakol. Toxikol., Univ. Rostock, DDR). **Toxikologische Eigenschaften von Chlorcholinchlorid und *N,N*-Dimethyl-(2-bromaethyl)-hydraziniumbromid. [Toxicologic characteristics of chlorocholine chloride and *N,N*-dimethyl-(2-bromoethyl)-hydrazinium bromide.]** *Acta Biol. Med. Germ. 27: 663-666; 1971.* (7 references) (German)

Toxicologic characteristics of CCC (chlormequat chloride) and a derivative, *N,N*-dimethyl-(2-bromoethyl)-hydrazinium bromide (BMH), an experimental plant growth regulator, were investigated. The LD50 of CCC to male white mice (18-24 g) i.p. was 68 mg/kg; i.v., 7 mg/kg; and oral, 54 mg/kg. The LD50 of BMH to male white mice i.p. was 315 mg/kg; i.v., 72 mg/kg; and oral, 230 mg/kg. Death occurred within 0.5-15 min after administration, depending on dosage and administration route, and poisoning symptoms included salivation, lacrimation, respiratory failure, and terminal clonic convulsions, indicating a cholinergic action mechanism. The LD50 was slightly increased by pretreatment with high dosages of atropine. Hexobarbital sleeping time was prolonged four hours after high doses of CCC or BMH. In anesthetized rats CCC caused a dose-dependent drop in blood pressure by 20-45% with a more gradual onset than that which results from choline chloride or acetylcholine. BMH also lowered blood pressure, and both compounds produced respiratory depression. Respiratory impairment was considered proximate cause of death after both compounds, occurring by way of bronchial constriction and increased secretion.

73-2881. Schmidt, J.; Wolf, H. (Inst. Pharmakol. Toxikol., Med. Akad., Magdeburg, DDR). **Der Einfluss von Atropin und Hemmstoffen der Cholinesterase auf durch Zahnpulpareizung ausgeloeste Hirnpotentiale. [Effect of atropine and cholinesterase inhibitors on brain potentials produced by dental pulp stimulation.]** *Acta Biol. Med. Germ. 29: 723-728; 1972.* (15 references) (German)

Subcutaneous injection of 0.2-1.0 mg/kg physostigmine, 5 mg/kg galanthamine, 0.1-0.5 mg/kg paraoxon, or 0.2-0.5 mg/kg DFP resulted in a dose-dependent depression of the primary potentials initiated by dental pulp stimulation in rabbits. The inhibition of the potentials remained constant despite changes in stimulation intensity, in contrast to results with arecoline and oxytremorine. Administration of 0.2-1.0 mg atropine produced dose-dependent increases in the amplitudes of the induced potentials. The quantities of cholinesterase inhibitors which inhibited the potentials were highly similar to the quantities which produced cholinesterase inhibition, suggesting that the effect on the potential is linked with a rise in endogenous acetylcholine. Other effects, independent of cholinesterase inhibition, may also be involved. The results again confirm the hypothesis of involvement of central muscarinic receptors in the central nervous system processing of nociceptive stimuli.

73-2882. Froeslie, A. (Nat. Vet. Inst., Oslo, Norway). **Methaemoglobin formation by diamino metabolites of DNOC and DNBP.** *Acta Pharmacol. Toxicol. 32(3-4): 257-265; 1973.* (12 references)

Diamino metabolites of DNOC and DNBP (dinobuton) were active inducers of methemoglobin formation in vitro at a concentration of $5 \times 10^{-4} M$. Marked hemoglobinemia was observed almost immediately in a goat given an intraperitoneal injection of 2-methyl-4,6-diaminophenol (DAOC) at 33 mg free amine/kg, and the goat died within 45 min. A slower and less pronounced development of methemoglobinemia developed following ruminal administration of the same dose of DAOC. Hemoconcentration was observed in both cases, and hemolysis and nephrotic lesions were found in the latter. At 43 mg/kg, a corresponding molar dose, 2-(1-methyl-*n*-propyl)-4,6-diaminophenol (DABP) gave similar results, except that after ruminal administration death occurred within 3 hr instead of 16 to 20 hr, and hemolysis and nephrotic lesions were not observed. Intraperitoneal administration of both compounds to pigs produced immediate methemoglobinemia and death within 1 hr. The results confirm the hypothesis that methemoglobinemia following dinitrophenol poisoning in ruminants may be due to the diaminophenol metabolites.

73-2883. Baage, G.; Cekanova, E.; Larsson, K. S. (Lab. Teratol., Karolinska Inst., S-104 01 Stockholm, Sweden). **Teratogenic and embryotoxic effects of the herbicides di- and trichlorophenoxyacetic acids (2,4-D and 2,4,5-T).** *Acta Pharmacol. Toxicol. 32(6): 408-416; 1973.* (16 references)

Commercial preparations of 2,4,5-T alone and 2,4-D and 2,4,5-T in combination were tested in mice to determine teratogenic effects. Fetal mortality significantly increased at both 50 and 110 mg/kg 2,4,5-T and at 110 mg/kg 2,4-D:2,4,5-T in a 2:1 mixture; with these dosages the frequency of cleft palate increased to the same degree as fetal mortality. Retarded fetal growth, subcutaneous bleeding, and malformations of ribs and vertebrae were observed at the highest dose (110 mg/kg) of each preparation. The results indicate that commercial preparations of 2,4-D and 2,4-D:2,4,5-T, which contained < 1 ppm dioxins, exhibited teratogenicity and embryotoxicity at about the same level as has been reported for the compounds themselves. These doses are extremely high in relation to possible levels of exposure of pregnant women; such exposure probably does not pose a risk to the human embryo.

73-2884. Sobels, F. H. (Dept. Radiation Genetics Chem. Mutagenesis, State Univ. Leiden, Wassenaarsweg 62, Leiden, The Netherlands). **Some aspects of chemical mutagenesis.** *Ag. Actions 3(2): 68-72; 1973.*

Mutations arising from environmental chemicals are generally produced by alkylation of biologically important macromolecules and subsequent alterations in

pairing of amino acids. Chemical mutations are more frequently gene mutations than chromosome rearrangements such as translocations, and genetic damage may not be expressed for many generations. Polyfunctional agents produce more extensive cross-linkage with time of storage than monofunctional agents like ethylene oxide and are superior in cancer therapy. Evaluation of potential genetic damage from environmental chemicals involves bacterial assays, host-mediated assays, and more laborious mammalian tests. Responses may vary for a number of reasons. It is difficult to assess the impact of such chemicals on man.

73-2885. Tryphonas, L.; Nielsen, N. O. (Dept. Vet. Pathol., Western College Vet. Med., Univ. Saskatchewan, Saskatoon, Saskatchewan, Canada). **Pathology of chronic alkylmercurial poisoning in swine.** *Amer. J. Vet. Res. 34(3): 379-392; 1973.* (36 references)

The nervous, urinary, and digestive systems of swine were affected by administration of methylmercuric dicyandiamide (MMD) for 60 days and ethylmercuric chloride (granosan) (EMC) for 90 days. The most obvious clinical signs were neurologic. Neuronal necrosis followed by secondary gliosis, capillary endothelial proliferation, and degenerative arteriopathy in the blood vessels supplying injured gray matter (which caused further neuronal necrosis) were observed. EMC was much more toxic than MMD; histopathologic observations indicated that pigs given 0.38 mg/kg/day would have had clinical signs a short time after termination of the experiment. Mean tissue concentrations reflected doses administered, but a brain mercury level above 7 μg of Hg/g was the best indicator of injury. Levels of Hg found in kidney, liver, and muscle, the most commonly eaten portions of an animal carcass, were high enough to be potentially hazardous to man.

73-2886. Kruckenberg, S. M.; Strafuss, A. C.; Marsland, W. P.; Blauch, B. S.; Marsh, R. T.; Vestweber, J. G. E.; Winter, W. G. (Dept. Pathol., College Vet. Med., Kansas State Univ., Manhattan, KS 66506). **Posterior paresis in swine due to dermal absorption of the neurotoxic organophosphate tri-*o*-tolyl phosphate.** *Amer. J. Vet. Res. 34(3): 403-404; 1973.* (12 references)

Topical administration of tri-*o*-tolyl phosphate (tri-*o*-cresylphosphate) to swine every 48 hours for up to 83 treatments resulted in the appearance of posterior paresis between days 70 and 166. Marchi's globules were found in the fasciculus gracilis and in the lateral and ventral funiculi on examination of the spinal cord, indicating demyelination. No acute symptoms such as diarrhea, miosis, salivation, muscle fasciculations, or tremors were observed, and weight gain was not significantly different until the 100th day. Swine seem to develop clinical signs of paresis similar to those seen in humans exposed to TOCP and appear to be suitable for testing the effects of neurotoxic organophosphates.

73-2887. Reid, W. D.; Ilett, K. F.; Glick, J. M.; Krishna, G. (Executive Off. President, Special Action Off., Drug Abuse Prevention, Washington, DC 20500). **Metabolism and binding of aromatic hydrocarbons in the lung. Relationship to experimental bronchiolar necrosis.** *Amer. Rev. Resp. Dis. 107: 539-551; 1973.* (31 references)

Piperonyl butoxide, which has been reported to reduce the hepatic necrosis associated with administration of bromobenzene in rats, did not alter the bronchiolar necrosis induced by this aromatic hydrocarbon in mice. The fact that piperonyl butoxide did not reduce the total in vitro metabolism or binding of bromobenzene to mouse lung microsomes (but did inhibit metabolism and binding in mouse liver microsomes) supports the assumption that tissue necrosis is associated with a bound metabolite of the hydrocarbon. In vivo binding of bromobenzene was inhibited by piperonyl butoxide. This could have been partially due to the effect of the synergist on liver metabolism.

73-2888. Grolleau, G.; Froux, Y. (Lab. Petits Vertebres, Cent. Nat. Recherches Zootech., Jouy en Josas, France). **Effet de l'heptachlore sur la reproduction de la caille *Coturnix coturnix japonica*. [Effect of heptachlor on the reproduction of quail *Coturnix coturnix japonica*.]** *Ann. Zool. Ecol. Anim. 5(2): 261-270; 1973.* (42 references) (French)

The effects of daily 0.05 to 1 mg doses of heptachlor, administered orally to egg-laying quails for 18 to 32 days, were studied on the weight of the eggs, the hatching rate, and the mortality rate of the progeny. Heptachlor did not affect either the volume of the eggs laid or their mean weight. Heptachlor residues ranging from 1 to 17 ppm were detected in the eggs from heptachlor-treated quails. Such residue contents failed to reduce hatching rate and embryonic mortality. The highest dose of heptachlor, however, significantly increased statistically the mortality rate of the progeny during the first seven days after hatching (50% versus 2% determined for a control group). The short-term poisoning in female quails did not affect the sexual maturation or fertility of the surviving progeny.

73-2889. Cox, D. P.; Alexander, M. (Lab. of Soil Microbiol., Dept. of Agron., Cornell Univ., Ithaca, NY 14850). **Effect of phosphate and other anions on trimethylarsine formation by *Candida humicola*.** *Appl. Microbiol. 25(3): 408-413; 1973.* (7 references)

Phosphate inhibited the formation of trimethylarsine from arsenite, arsenate, and monomethylarsonate, but not from dimethylarsinate, by growing cultures of *Candida humicola*. Phosphite suppressed trimethylarsine production by growing cultures from monomethylarsonate but not from arsenate and dimethylarsinate, and hypophosphite caused a temporary inhibition of both proliferation and the conversion of these three

arsenic sources to trimethylarsine. Resting cells of *C. humicola* derived from cultures grown in arsenic-free media generated the volatile arsenical only after a lag phase. High antimonate concentrations reduced the rate of conversion of arsenate to trimethylarsine by resting cells, but nitrate was without effect. (Author abstract by permission)

73-2890. Ahmed, M. M. (Dept. Anatomy, Fac. Med., Univ. Singapore, Sepoy Lines, Singapore 3, Singapore). **The ultrastructure of tricresylphosphate poisoning in primates. 1. Studies on axonal alterations in the spinal cord.** *Arch. Histol. Jap. 35(4): 283-288; 1973.* (18 references)

Marked neurotoxic effects were observed on examination of the fine structure of the long descending tracts and anterior horn of the lumbar region of the spinal cord taken from slow lorises treated with TOCP (tri-*o*-cresylphosphate). The effects included mitochondrial swelling, shrinkage of the axoplasm, appearance of large, membrane-bound vacuoles in the axoplasm, and separation of the myelin sheath with loss of its laminar structure and axoplasm; these were similar to those observed in birds treated with TOCP. All animals were examined 6-8 weeks after a 10-day application of TOCP at the rate of 0.2 cc/kg/day and when gastro-intestinal disturbances, marked ataxia, and motor paralysis of the hind limbs were evident.

73-2891. Singh, P. K. (Cent. Rice Res. Inst., Cuttack-6, Orissa, India). **Effect of pesticides on blue-green algae.** *Arch. Mikrobiol. 89: 317-320; 1973.* (7 references)

The order of toxicity of four organochlorines to two nitrogen-fixing and one non-nitrogen-fixing blue-green algae was BHC > lindane > diazinon > endrin. All three algae survived up to 600 μg/ml of endrin for up to 18 days. Concentrations of BHC > 10, 30, and 50 μg/ml were lethal to *Cylindrospermum* sp., *P. boryanum*, and *A. fertilissima* Ghose, respectively. The pesticides were not used as a nitrogen source by *P. boryanum*.

73-2892. Nasta, A.; Gunther, E. (Sekt. Biol., Ernst-Moritz-Arndt Univ., Greifswald, DDR). **Haeufigkeit von chlorophylldefekten Pflanzen nach Behandlung mit einem Carbamatherbizid und damit kombinierten Mutagenen bei *Hordeum vulgare*. [Frequency of chlorophyll-deficient barley plants after treatment with a carbamate herbicide, with or without known mutagens.]** *Biol. Zentralbl. 92(2): 173-178; 1973.* (12 references) (German)

The occurrence of chlorophyll-deficient plants was examined after application of the herbicide Elbanil (25% chlorpropham), with or without exposure to x-irradiation and the known mutagen ethylmethanesulfonate (EMS). Ten ml of a 0.005% chlorpropham solution was poured onto blotting paper in a Petri dish containing 300 barley karyopses; the contact time was 18 hr. After rinsing the karyopses were kept moist for 6 hr, with or without a 10-min x-ray treatment or exposure to 0.15% EMS solution. Six hours after herbicide treatment the karyopses were sown in an experimental field. About 2000 heads of each variant were cut and threshed when the barley had ripened, and some seeds from each group were planted. The chlorophyll mutants in both generations of seedlings were counted and classified according to Gustaffson as albina, xantha, viridis, or miscellaneous (striata, tigrina, maculata etc.). Elbanil increased the mutation rate by about 2.5 times compared to the controls; a 7-fold increase was produced by x-irradiation, and a 20-fold increase by EMS. Combined application of herbicide and mutagen gave a mutation rate somewhat lower than that found for the mutagen alone.

73-2893. Moylan-Jones, R. J.; Thomas, D. P. (Med. Div., CDE Porton, Salisbury, Wiltshire, England). **Cyclopentolate in treatment of sarin miosis.** *Brit. J. Pharmacol. 48(2): 309-313; 1973.* (6 references)

Male volunteers were exposed to sarin vapor at a concentration of 0.5 mg/m^3 for 30 min; each eye was treated after 5 hr with 0.06 ml of 1% cyclopentolate to determine the usefulness of this preparation in relieving the ophthalmic disturbances produced by the organophosphate. Visual acuity at six and three meters was retained in most subjects after sarin exposure, but cyclopentolate reduced near visual acuity. Relaxation of the iris followed treatment although pre-exposure pupil areas were not attained. Unless ocular symptoms are disabling or an individual must work under conditions of low light, treatment of the ophthalmic syndrome resulting from exposure to organophosphates at comparable doses is not recommended.

73-2894. Foley, D. J.; McPhillips, J. J. (Dept. Pharmacol., Div. Med. Chem., Walter Reed Army Inst. Res., Washington, DC). **Response of the rat ileum, uterus and vas deferens to carbachol and acetylcholine following repeated daily administration of a cholinesterase inhibitor.** *Brit. J. Pharmacol. 48(3): 418-425; 1973.* (30 references)

In female rats treated for eight days with disulfoton at 1 mg/kg the ileum showed a reduced sensitivity to carbachol of about 2.5 times while the uterine horns did not exhibit any change in sensitivity. Ileum taken from males treated with disulfoton at 2.5 mg/kg showed the same degree of reduced sensitivity, and the vas deferens was not affected. Marked changes in sensitivity to ACh were observed in ileum and vas deferens taken from treated animals. Hydrolysis of ACh and methacholine was inhibited more than 50% in all three tissues of treated animals. The lower response of uterus and vas deferens to disulfoton appears to be related to the lower amount of ACh released from nerve terminals rather than a difference in response of AChE.

73-2895. De Pontanel, H. G.; Aldighieri, R.; Astier-Dumas, M. (Cent. Rech. Foch, Paris, France). **Les diphenyles polychlores utilises dans l'industrie. Mesures a prendre. [Industrially utilized polychlorinated biphenyls: measures to be taken.]** *Bull. Acad. Nat. Med. 156(30-31): 989-994; 1972.* (13 references) (French)

The general environmental problems created by polychlorinated biphenyls, proposed limitations on the use of such products, and observations on the synergism of PCB with organochlorine pesticides are described. One PCB product containing 42% chlorine had an LD50 value of about 4 mg/kg in rats. Redistribution of the PCB and DDT residues in the adipose tissues during fasting periods was observed in birds, and PCB levels increased in the cerebrum and the respiratory muscles during fasting. The presence of PCB appeared not to influence the DDT retention, whereas the presence of DDT and its metabolites led to increased PCB levels in birds receiving both DDT and PCB as compared to birds receiving PCB only.

73-2896. Elgart, M. L.; Higdon, R. S. (Washington, DC). **Pediculosis pubis of the scalp.** *Arch. Dermatol. 107: 916-917; 1973.* (2 references)

Two female patients with *Pediculis pubis* infestations of the scalp (and pubis) were successfully treated with Kwell Shampoo which contains 1% lindane. Scalp infestation by *Phthirus pubis* has been reported once. Two other cases of *Pediculis pubis* infestation of the scalp have been observed; it is suggested in the Letter-to-the-Editor that the scalp may be becoming a more common site of involvement.

73-2897. Drummond, D. C.; Rennison, B. D. (Pest Infestation Control Lab., Min. of Agr., Fish., and Food, Tolworth, Surrey, England). **The detection of rodent resistance to anticoagulants.** *Bull. WHO 48(2): 239-242; 1973.* (2 references)

The procedures used in the United Kingdom to detect anticoagulant (warfarin) resistance in the Norway rat are described. Preliminary inspections are made of the suspect rat populations to exclude other possible causes of control failure. The inspections are followed by carefully supervised warfarin treatments in which the feeding pattern over 2-3 weeks is compared with that of normal rats. If rats continue to take the bait longer than is usual, laboratory tests are undertaken on trapped animals. It is believed that the methods will be found to be generally applicable to the investigation of anticoagulant resistance in other rodents in many parts of the world. (Author abstract by permission)

73-2898. Hall, B. K. (Dept. of Biol., Life Sci. Cent., Dalhousie Univ., Halifax, N.S., Canada). **Achondroplasia in the embryonic chick: its potentiation by cortisone acetate and alleviation by vitamin C.** *Can. J. Zool. 50(12): 1527-1536; 1972.* (37 references)

Tibiae from untreated chick embryos cultured in embryo extract from thallium sulfate treated embryos and tibiae of host embryos injected with homogenates from thallium sulfate treated embryos exhibited normal growth, histology, histochemistry, hydroxyproline, and hexosamine activity. Thus the achondroplasia observed in thallium sulfate treated embryos does not result from the production of an inhibitor to normal chondrocyte growth and function which is transmissible in saline extracts. This is in contrast to some genetic achondroplasias. Coinjection of thallium and vitamin C or of thallium and cortisone acetate (agents increasing or decreasing collagen and hexosamine-containing acid mucopolysaccharide synthesis respectively) resulted in potentiation of the syndrome in the presence of cortisone acetate and alleviation of the syndrome in the presence of vitamin C. Vitamin C prevented the production of the defective cartilage matrix characteristic of the long bones of embryos treated with thallium sulfate alone. It was concluded that abnormalities in acid mucopolysaccharide and collagen release from chondrocytes and deposition in the cartilaginous matrix were possible causes of the chondrocyte necrosis, achondroplasia, and micromelia characteristic of the achondroplastic syndrome. (Author abstract by permission, abridged)

73-2899. Tegelstrom, H.; Wahren, H. (Dept. of Genetics, Univ. of Uppsala, S-750 07 Uppsala 7, Sweden). **The effect of an *N*-methylcarbamate on esterases from snail, mouse and man studied by starch-gel electrophoresis.** *Comp. Biochem. Physiol. 43B(2): 339-343; 1972.* (16 references)

The inhibitory effect of the active component in the snail-poison Mesurol (3,5-dimethyl-4-methylmercapto-phenyl-*N*-methyl-carbamate, methiocarb) has been compared with the effect of eserine (salicylate) on esterases from snail, mouse, and man after starch-gel electrophoresis. The carbamate affects the same esterases as eserine, plus certain other esterases in snail and mouse. For further characterization, substrate-specificity and inhibition/activation tests must be applied. However, the possibility of using carbamates to differentiate and define configurational differences at the enzyme surface is pointed out. (Author abstract by permission)

73-2900. Collet, G. F. (Sta. Fed. Rech. Agron. de Lausanne, CH-1005 Lausanne, Switzerland). **Capacite de detoxication et sensibilite aux urees substituees, selon l'espece vegetale. [The substituted urea-detoxifying capacity and sensitivity of various plant species.]** *C. R. Acad. Sci. Ser. D 276(9): 1425-1428; 1973.* (7 references) (French)

The detoxifying capacity for methabenzthiazuron (1,3-dimethyl-(2′-benzothiazolyl) urea) of hydroponic cultures of resistant species (*Galium aparine* L. and *Triticum vulgare* L. cv Vilmorin 27) and of susceptible species (*Sinapis alba* L. and *Lycopersicum esculentum* L.

cv Mont Favez 63-4) was studied through the determination of residue levels and metabolite levels by thin-layer chromatography and autoradiography. The herbicide concentrations applied to the resistant and susceptible species were 0.0002 and 0.00002 *M*, respectively. The resistance of the different species to methabenzthiazuron depended on the metabolism in the leaves rather than in the roots. Simple catabolites and condensation products of hydroxymethyl methabenzthiazuron with a natural metabolite (glucose) were formed. Methabenzthiazuron was more or less rapidly transformed into nonphytotoxic catabolites or conjugates. The resistance, and even the survival of the plants treated, is determined by the rate of hydroxylation of the methyl at position 1.

73-2901. Wichman, J. R. (Purdue Univ., Lafayette, IN). **Uptake, distribution, and degradation of simazine by black walnut and yellow poplar seedlings.** *Diss. Abstr. Int. 34(1): 13B-14B; 1973.*

Three-month-old and one-year-old black walnut (*Juglans nigra* L.) and yellow poplar (*Liriodendron tulipifera* L.) seedlings were treated with ring-labeled ^{14}C-simazine in nutrient culture. Concentrations of simazine and the phytotoxic degradation product monodealkylated simazine were significantly higher in leaves of yellow poplar than in black walnut; the difference was more pronounced for three-month-old seedlings. Simazine degradation proceeded rapidly in both species and *N*-dealkylation was a major pathway. Monodealkylated simazine and 2-chloro-4,6-diamino-*s*-triazine were found in various tissues of both species. Hydroxysimazine was found in yellow poplar roots but not in any black walnut extracts. Two other degradation products were isolated but not identified in both species. *N*-dealkylation of simazine occurred independently in leaf disks and root sections of yellow poplar and in leaf disks of black walnut. Significant quantities of ring-labeled ^{14}C-simazine were not converted to $^{14}CO_2$ by either species during the 12 days following treatment. Low levels of simazine and atrazine, an average of 0.23 ppm, were found in leaves of three-year-old black walnut seedlings in three months following treatment under field conditions. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-15,889).

73-2902. Draggan, S. (Rutgers Univ., New Brunswick, NJ). **Diazinon and carbaryl: effects on the soil biota of a soybean ecosystem.** *Diss. Abstr. Int. 34(1): 177B; 1973.*

Soil treated with diazinon at 4 lb/A and subsequently planted with soybean showed increased cellulose decomposition in one of the two plots. Soil in which the soybean crop was treated with a foliar spray of carbaryl at 1 lb/A decreased in cellulose decomposition in one of the two plots. Diazinon stimulated the biomasses of *Raphanus raphanistrum, Agropyron repens,* and *Ambrosia artemisiifolia* and inhibited growth of *Convolvulus sepium.* Limited insecticide effects indicative of the nonpersistence of the chemicals were seen in soil microinvertebrates. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-15,667.)

73-2903. Dvorchik, B. H. (Univ. Florida, Gainesville, FL). **The distribution, binding, fate, and toxicity of *p,p'*-DDT [2,2-bis(*p*-chlorophenyl)-1,1,1-trichloroethane] in the dogfish, *Squalus acanthias.*** *Diss. Abstr. Int. 34(1): 337B; 1973.*

Ring labeled ^{14}C-*p,p'*-DDT was associated with plasma lipoproteins after intravenous administration; the material was taken up by all organs. The ratio of DDT in liver lipid to DDT in muscle lipid was 2:1, probably because uptake of lipoproteins was slower by the muscles than by the liver. Excretion of the drug through the bile, urine, or gills was negligible during a 2-hr period when blood levels were maximum. At least 95% of the material present in the liver over a 17-day period was the parent compound. The 24-hr intravascular LD50 was approximately 10 mg/kg. Brain levels of DDT in the dogfish which died indicate that brains of these elasmobranchs may be more sensitive to DDT than those of mammals. (Author abstract by permission, abridged. Copies of the thesis are available from Univerity Microfilms, Order No. 73-15,571.)

73-2904. Van Alfen, N. K. (Univ. of California, Davis, CA). **Microbial metabolism of the fungicide, 2,6-dichloro-4-nitroaniline.** *Diss. Abstr. Int. 34(2): 487B; 1973.*

Seventeen fungi and 18 bacteria were screened for their capacity to metabolize radiolabeled 2,6-dichloro-4-nitroaniline (DCNA, dichloran) in liquid culture. Many organisms converted DCNA to six or more metabolites. Two metabolites were identified as 2,6-dichloro-*p*-phenylenediamine (DCPD) and 4-amino-3,5-dichloroacetanilide (ADCAA). *Pseudomonas capecia* and other bacteria completely metabolized DCNA within 48 hours and accumulated ADCAA as the major metabolite. Most fungi accumulated small amounts of these compounds and formed different DCNA metabolites. Low aeration favored conversion of DCNA to DCPD and ADCAA by the bacteria. The fate of DCNA in flooded soil amended with D-glucose (1%, w/w) was investigated using ^{14}C-DCNA. After two days' incubation over 80% of the DCNA had been metabolized. No metabolic carbon dioxide from DCNA was detected during the nine day experiment. ADCAA accumulated in large amounts in the soil. Also identified as metabolites of DCNA in the soil were DCPD and one of three isomers of the azine resulting from oxidative dimerization of DCPD. The same oxidation product was found after treatment of DCPD with horseradish peroxidase. Based on the toxicity of DCPD and ADCAA to a number of fungi sensitive to DCNA, metabolism of DCNA to these com-

pounds appears to represent detoxication. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-19,113.)

73-2905. Tseng, Y. L. (Univ. Maryland, College Park, MD). **Effects of phenobarbital and dieldrin treatment on biochemical changes in liver and metabolism of dicrotophos, dimethoate, and phosphamidon insecticides in mice.** *Diss. Abstr. Int. 34(2): 706B; 1973.*

Daily 75 mg/kg phenobarbital i.p. injections for three days or 25 ppm dieldrin in the diet of mice increased the activities of liver A-esterase, liver cytochrome P-450, and plasma B-esterase. Phenobarbital and dieldrin induced oxidative and hydrolytic metabolism of dicrotophos, dimethoate, and phosphamidon by liver homogenates or microsomes plus 105,000 g supernatant fractions. Pretreatment increased more than 4-fold the concentration of the active acetylcholinesterase inhibitor, dimethoxon, after incubation for four hours at 37°C with NADPH added. The organophosphorus insecticides used in this study were not metabolized as well by the liver microsomes alone or 105,000 g supernatant alone. Phenobarbital and dieldrin treatments increased the recovery of metabolites in mouse urine in the first six hours after dimethoate-carbonyl-^{14}C or phosphamidon-*N*-ethyl-^{14}C administration. The inducers caused a more than 6-fold increase in dimethoxon recovered and a 2-foid increase in water-soluble nontoxic metabolites in the urine within six hours after dimethoate administration. With phosphamidon both inducers increased the rate of metabolism, and the total recovery in aqueous and chloroform fractions was decreased. The results suggest that in whole animals, increased dimethoate toxicity after phenobarbital and dieldrin treatments is due to the fact that inducers stimulate activation of dimethoate to dimethoxon, while the increase in hydrolysis products after pretreatment decreased toxicity of dicrotophos and phosphamidon. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-18,746).

73-2906. Ferebee, R. N. (Clemson Univ., Clemson, SC). **The effects of selected herbicides on bacterial populations in an aquatic environment.** *Diss. Abstr. Int. 34(2): 779B; 1973.*

A laboratory culture system was used to continuously culture mesophilic, heterotrophic bacteria derived from a freshwater reservoir. Alterations in bacterial numbers and diversity of genera were studied both before and after additions of selected herbicides. Identical techniques for isolation and identification were used to compare culturable heterotrophic bacteria from a freshwater reservoir with those in the laboratory culture system. Three chemicals, representing the phenoxyalkonic acid, substituted urea, and dipyridyl classes of herbicides, were added to circulating vat culture vessels which contained untreated reservoir water. At concentrations to 1.4 mg/l. 2,4,5-T did not significantly affect that portion of the bacterial population tested. When the bacteria were exposed to 1.4 mg/l. paraquat there was an increase in counts and evidence for an enrichment process. Findings following use of this herbicide suggest both direct and indirect effects on the bacterial populations. Diuron (1.4 mg/l.) caused rapid increases in total counts with a following decrease. This herbicide also appeared to cause a decrease in genera diversity. The herbicides tested all remained qualitatively measurable in the culture system for three weeks. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 73-19,263).

73-2907. Ledoux, T. A. (Univ. Illinois, Urbana-Champaign, IL). **The effects of low dietary levels of technical DDT on reproductive efficiency in hybrid mice.** *Diss. Abstr. Int. 34(2): 836B; 1973.*

Feeding 5, 10, or 20 ppm DDT to B6D2F$_1$ hybrid mice in a breeding experiment produced an increase over the controls in litter size and number weaned. The offspring, continuously fed their respective levels of DDT, were used in a timed mating experiment. Reproductive efficiency increased on day 18 of gestation and was associated with an increased number of corpora lutea and viable fetuses and a decrease in reabsorptions. A second breeding experiment using 30, 60, or 120 ppm DDT showed a general detrimental effect on reproduction. Timed mating of these offspring, continuously fed their respective diets, failed to show any significant difference in corpora lutea, reabsorptions, or viable fetuses after 18 days of gestation. Ten ppm DDT did not change uterine weight, and did not significantly affect the number of ova fertilized at 36 hr post mating or seven day implantation sites. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-17,292).

73-2908. Sharpee, K. W. (Cornell Univ., Ithaca, NY). **Microbial degradation of phenoxy herbicides in culture, soil, and aquatic ecosystems.** *Diss. Abstr. Int. 34(3): 954B; 1973.*

In studies on degradation of 2,4-D, 2-chloro-4-carboxymethylene but-2-enolide was formed from *cis, cis*-2,4-dichloromuconate by a lactonizing enzyme obtained from *Arthrobacter* sp. isolated from soil. Manganous ions were required for activity and stability of the lactonizing enzyme. In experiments aimed at determining intermediates between 2-chloromaleylacetate and succinate, both D-chlorosuccinate and L-chlorosuccinate were poor substrates for *Arthrobacter* sp., indicating that chlorosuccinate is not an intermediate in conversion of chloromaleylacetate to succinate. Cell-free extracts of the organism converted the chlorosuccinate compounds to small amounts of malate and fumarate, indicating that

the last chlorine from 2,4-D was removed by displacement with a hydroxyl group. A pathway was proposed for the metabolism of 2,4-D, in which coenzyme A is the carrier for the intermediates between chloromaleylacetate and succinate. In soil and in a fresh water and sediment system small amounts of 2,4-dichlorophenol or 2,4,5-trichlorophenol accumulated during degradation of 2,4-D or 2,4,5-T. Neither of the phenols persisted as long as the parent herbicides. Degradation appeared to be mainly microbial. One or more unknown compounds was detected when 2,4-D was added to the fresh water and sediment system and persisted long after the 2,4-D had disappeared. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-20,177).

73-2909. Cole, D. R. (Texas A&M Univ., College Station, TX). **The effects of DDT and other insecticides on accumulation, growth and photosynthesis in *Chlorella pyrenoidosa* Chick.** *Diss. Abstr. Int. 34(3): 1133B; 1973.*

Incubation of *Chlorella pyrenoidosa* Chick with insecticides and related compounds demonstrated the ability of these substances to inhibit growth and photosynthesis in freshwater as well as marine algae. When algae concentrations were high (1 mg/ml or 100 μg/ml), growth and photosynthesis were scarcely inhibited but the chemicals were effective at low algae concentrations. The most effective growth inhibitor was PCB (Aroclor 1254) followed by amitrole in both single and multiple dose experiments; Aroclor 1242, piperonyl butoxide, and parathion were also effective inhibitors with DDT less so; and dieldrin and carbaryl were the least effective inhibitors of both growth and photosynthesis. Aroclor 1254 and *d*-aminolevulinic acid acted synergistically and effectively. Consistent results were not attained in experiments aimed at measuring uptake and accumulation. Attempted extraction of algae for gas chromatographic analysis gave poor recoveries, indicating that the test alga binds insecticides extremely well. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-21,652).

73-2910. Doherty, J. D. (Univ. Wisconsin, Madison, WI). **ATP related systems in lobster nerve with particular reference to the mode of action of DDT.** *Diss. Abstr. Int. 34(3): 1134B; 1973.*

DDT had various effects on ^{32}P incorporation from labeled ATP into endogenous material and added histone in lobster nerve. DDT inhibited ^{32}P incorporation into the Na^+ and K^+ stimulated Mg^{++} dependent pump ATPase (system 1). DDT increased ^{32}P incorporation into membrane bound proteins when low (1×10^{-8} *M*) ATP was used as the substrate in the presence of K^+, Mg^{++}, and small amounts of Na^+ (system 2). DDT increased phosphorylation into added histone in an incubation medium containing soluble enzymes (system 3). DDT inhibited ^{32}P incorporation into histone when microsomal enzymes were assayed (system 4). DDT partially reversed the action of a c-AMP dependent protein kinase present in lobster nerve (system 5). In the absence of histone, c-AMP inhibited ^{32}P incorporation and reversed some of the incorporation caused by DDT (system 6). Systems 1 and 2 and possibly 3 are considered to be causally related to the insecticidal action of DDT. Facts implicating system 2 as being involved in neural function are numerous: it is sensitive to a variety of neuroactive agents; it shows properties of being membrane bound; and is highly pH and ion dependent, being activated by K^+ and Mg^{++}, while Na^+ and Ca^{++} favor its dephosphorylation. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-19,296.)

73-2911. Komer, E. G. (Univ. Missouri, Columbia, MO). **Effects of chronic levels of dieldrin on ammonia and amino acid metabolism in sheep and rats.** *Diss. Abstr. Int. 34(3): 1140B; 1973.*

Dietary dieldrin levels of 0.1-10 ppm were fed to albino rats, and dietary dieldrin at 3-27 ppm fed to crossbred yearling lambs. Enzyme activities were assayed in livers and brains. The serum and brain total α-amino acid concentrations of male rats treated with dieldrin increased by 6-8% and 14-30%, while the corresponding amino acid levels in female rats decreased by 6-8% and 14-30% and 13-15% respectively. Total serum α-amino acid concentrations of lambs were unchanged due to dieldrin treatment, but the brain total α-amino acid levels were decreased by 30-50%. The total brain α-amino acid:essential amino acid ratios for lambs treated with 0, 3, 9, and 27 ppm dietary dieldrin were 16.6, 12.6, 14.5, and 11.2, respectively. The growth rates of lambs treated with dieldrin were significantly decreased; lamb liver weight:body weight ratios were significantly increased. Of the significant responses to dieldrin treatment the 30-50% inhibitions of lamb liver glutamine transferase, glutamate dehydrogenase, and glutamate pyruvate transaminase were most dramatic. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-21,446.)

73-2912. Valentine, J. P. (Virginia Polytech. Inst. State Univ., Blacksburg, VA). **The influence of four algae on herbicide residues in water.** *Diss. Abstr. Int. 34(3): 1251B-1252B; 1973.*

Removal of 2,4-D-2-^{14}C from water was pronounced with *Scenedesmus quadricauda* (Turp.) Breb., and most effective uptake occurred at pH 4.7. Three other algae were relatively ineffective. With a range of herbicide concentrations (0.01 to 1.0 ppm) the amount removed was highest at the highest concentration; however, a higher percentage of the chemical was removed at

lower concentrations. An equilibrium of ^{14}C removal from water and ^{14}C released to the water was reached within six hours. More herbicide was removed from water by *Scenedesmus* in darkness than in light, and low temperature reduced uptake slightly. *Scenedesmus* metabolized uniformly ring-labeled 2,4-D in 24 hr to several products. One product in suspension fluid was identified as (5-hydroxy-2,4-dichlorophenoxy) acetic acid. Quantitatively, (3-hydroxy-2,4-dichlorophenoxy)acetic acid was the major metabolite, comprising 26% of the radioactivity extracted from cells compared to 15% for suspension fluid. Removal of amitrole-^{14}C from water by algae was greater at pH 7.5 or above than at lower pH levels. Amitrole-^{14}C removal by *Scenedesmus* was directly related to herbicide concentration while atrazine-^{14}C removal was inhibited by increasing concentrations. Optimum light and temperature for algal growth favored amitrole-^{14}C uptake. Atrazine-^{14}C removal was unaffected by either darkness or low temperature. Atrazine-^{14}C was not metabolized to detectable levels by *Scenedesmus*, but amitrole-^{14}C was. Three metabolites-^{14}C were extracted from cells while four chromatographically different metabolites-^{14}C occurred in the suspension fluid. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-21,522.)

73-2913. Shulyakovskaya, T. S.; Saprin, A. N.; Emanuel', N. M. (Inst. Chem. Physics, Acad. Sci. USSR, Moscow, USSR). **Deystviye khimicheskikh soyedineniy razlichnoy toksichnosti na soderzhaniye svobodnykh radikalov i mikrosomal'nuyu sistemu mnogotselevykh oksidaz v pecheni zhivotnykh. [The effect of chemical compounds of different toxicity on the free radical content and the microsomal system of mixed function oxidases in the animal liver.]** *Dokl. Akad. Nauk SSSR 210(1): 221-223; 1973.* (5 references) (Russian)

Fifty mg/kg of DDT, 0.1-0.2 mg/kg of benzene, 400 mg/kg of ionol (BHT), 100 mg/kg of 3-hydroxypyridine, 10 mg/kg of pyrocatechol, 12.5 mg/kg of phenothiazine, 17 mg/kg 10-acetyl-phenothiazine, or 19 mg/kg of chlorpromazine were orally administered to male Wistar rats, and the effects studied on the free radical level and the microsomal system of the mixed function oxidases of the liver by electron proton resonance spectroscopy. All substances increased the intensity of the signal with a g factor of 2.25. Although the intensity fell in the course of DDT and benzene administration, low-toxicity compounds were able to maintain high signal intensity over the entire test. These substances failed to change in hepatic free radical level. Benzene permanently increased the hepatic free radical level while the initial increase evoked by DDT was followed by a drop to below the normal level. Unlike benzene DDT was unable (i.e., had no time) to destroy the microsomal system of the mixed function oxidases.

73-2914. Ariyoshi, T.; Keshino, M.; Nojiri, T.; Takabatake, E. (Fac. Pharm. Sci., Nagasaki Univ., Nagasaki, Japan). **[Methylarsinic sulfide: its tissue distribution, excretion, and effects on the liver constituents and drug-metabolizing enzyme sytstem.]** *Eisei Kagaku (J. Hyg. Chem.) 19(4): 206-211; 1973.* (18 references) (Japanese)

After a single oral administration of 18 mg/kg of methylarsinic sulfide, a fungicide against *Pellicularia sasakii* on rice plant, the distribution of arsenic in blood and tissue, the excretion of arsenic in feces and urine, the fungicide's effects on liver constituents including microsomal phospholipids and cytochromes, and drug metabolizing enzyme activities were examined in male Wistar rats. The blood level of arsenic peaked at 75.2 μg/ml three days after the administration, then slowly decreased with a half-life of ca. 50 days. The distribution of arsenic in tissues also peaked at three days with the value largest in spleen followed by lung, kidney, liver, and heart. More than 2% of the dose was found after 120 days. During the first four days 33.4% of the arsenic was excreted, and a trace amount of arsenic was detected in the bile. The urinary excretion of arsenic was about 7% of the dose during the first 3 days, 18% after 30 days, and still detected after 120 days. Orally administered methylarsinic sulfide seems to be absorbed slowly and distributed to tissues, remaining in the body and requiring considerable time for excretion. The fungicide reduced the cytochrome P-450 content, aminopyrine demethylase activity, and spectral change (absorbance/mg protein) with aniline binding; however, enzyme activities per P-450 were not changed. In hepatic microsomal phospholipids the percentage composition remained unchanged, but the total content and the percentage of unsaturated fatty acids decreased.

73-2915. Matsueda, S.; Tsukada, N.; Uchiyama, M. (Fac. Pharm. Sci., Hirosaki Univ., Hirosaki, Japan). **[The effect of glutathione on human erythrocyte cholinesterase activity in the presence of an organophosphate insecticide in vitro.]** *Eisei Kagaku (J. Hyg. Chem.) 19(4): 236-237; 1973.* (4 references) (Japanese)

The effect of GSH (reduced glutathione) on human erythrocyte cholinesterase was investigated in the presence of parathion in vitro. Parathion (0.3 ml of a 10^{-3} mole/l. solution) was added to 0.7 ml of human blood, and the mixture was incubated for 30 min or 60 min at room temperature. After incubation a 0.1 ml aliquot was washed with 5 ml of physiological saline to yield the inhibited erythrocytes. When 0.1 ml of GSH (10^{-2} mole/l.) was added to the inhibited erythrocytes (the cholinesterase activities were 0.1 and 0.05 Δ pH respectively after 30 and 60 min of incubation), reactivation failed to occur because of renewed inhibition (activity 0.03 Δ pH). When the erythrocyte suspension was diluted 100-fold to prevent reinhibition and 1 ml of GSH added, the activity was rapidly restored to 0.34 Δ pH. The activity of inhibited erythrocytes diluted 100-fold without GSH was 0.17 Δ pH, showing that spontaneous recovery occurs. A similar experiment with 0.1-0.6 ml PAM (pralidoxime), 10^{-1} mole/l.) as the refer-

ence activator showed effectiveness of PAM even at 0.1 ml; this restored the activity to 0.34 Δ pH, compared to a normal activity of 0.46 Δ pH. The results show that GSH is approximately as effective as PAM in reactivating inhibited erythrocyte cholinesterase.

73-2916. Matin, M. A.; Kar, P. P. (Ind. Toxicol. Res. Cent., Chattar Manzil Palace, Lucknow, India). **Further studies on the role of γ-aminobutyric acid in paraoxon-induced convulsions.** *Eur. J. Pharmacol. 21(2): 217-221; 1973.* (18 references)

Brain GABA (γ-aminobutyric acid) significantly decreased and brain ACh increased one-half hour after administration of paraoxon to rats at 0.1 mg/kg s.c. Pretreatment of the rats with hydroxylamine restored the concentration of GABA to normal and afforded some protection against paraoxon-induced convulsions. Pretreatment with amino-oxyacetic acid significantly increased the GABA level above normal and completely protected the animals against convulsions. Although paraoxon-reduced GABA levels were increased by pretreatment with pyridoxine, protection against convulsions was not observed. None of the drugs significantly altered the paraoxon-induced increase in ACh or normal levels of ACh. The results suggest that the reduction of brain GABA may enhance the susceptibility of rats to convulsions and could partially explain the production of convulsions by paraoxon, but its convulsant activity is not completely dependent on this action.

73-2917. Graham, D.; Madden, J.; Mitchelson, F. (Dept. Pharmacol. Toxicol., Univ. Kansas, Lawrence, KS). **Changes in the sensitivity to cholinomimetic drugs of smooth and cardiac muscle in the rat induced by subacute administration of di-isopropyl phosphorofluoridate.** *Eur. J. Pharmacol. 23(1): 27-36; 1973.* (22 references)

DFP, administered subcutaneously to rats for 10 days at doses equivalent to 13 to 20% of the LD50, decreased hypotensive response and the bradycardia induced by carbachol and increased the resting mean blood pressure. The sensitivity of isolated ileum, bladder, and atrium to carbachol was decreased to a similar extent by DFP-pretreatment, and the sensitivity to methacholine and ACh increased in the bladder to a greater extent than in the ileum or atrium. Bladder AChE and ChE were inhibited over 90% in treated animals while only 56 and 37% inhibition of AChE were observed in atrium and ileum, respectively. The results indicate that enzyme inhibition observed following DFP administration for 10 days in rats does not correlate with the decrease in sensitivity of tissues to carbachol; association between accumulation of ACh and enzyme inhibition may be a more important factor.

73-2918. Ferry, C. B.; Marshall, A. R. (Dept. Pharmacol., Med. School, Univ. Newcastle upon Tyne, Newcastle upon Tyne NEl 7RU, England). **The nature of the physiologically important cholinesterase at mammalian endplates.** *Eur. J. Pharmacol. 23(1): 111-114; 1973.* (11 references)

The duration of the synaptic current recorded extracellularly from curarized rat diaphragms increased 10 to **40%** when 10 to 100 *μM* iso-OMPA (schradan) was added. Eyrthrocyte AChE was inhibited 30% and BuChE was almost completely inhibited when incubated with iso-OMPA at 30 *μM*. The effect on synaptic currents was much greater when preparations were incubated in 1 *μM* BW 284C51 (1,5-bis(4-allyl dimethylammonium phenyl)pentan-3-one dibromide), a specific inhibitor of AChE. The transmitter action at the neuromuscular synapse of the rat diaphragm is apparently terminated mainly through the action of AChE.

73-2919. Buswell, J. A.; Cain, R. B. (Dept. Biol., Paisley Coll. of Technol., Paisley, Renfrewshire, PA1 2BE, Scotland). **Microbial degradation of piperonylic acid by *Pseudomonas fluorescens*.** *FEBS (Fed. Eur. Biochem. Soc.) Lett. 29(3): 297-300; 1973.* (10 references)

The catabolism of piperonylate by *Pseudomonas fluorescens* is apparently achieved through co-oxidation. Fraction S3 of the ruptured cells, which contained the oxidative activity, converted piperonylate to the hydroxymethylenedioxy compound. This reaction was followed by spontaneous hydrolysis to protocatechuate and formic acid. Further conversion to 3-oxoadipate was observed. In the production of protocatechuate and formic acid NADH or NADPH was required and 1 mole of O_2 was consumed per mole of piperonylate.

73-2920. Komisarenko, V. P.; Kravchenko, V. I.; Tron'ko, M. D.; Turchin, I. S. (Inst. Endocrinol. Metab., Kiev, USSR). **Vpliv *o,p'*-DDD (khloditanu) na sekretsiyu ta obmin kortikosteroidiv u kurchat. [Effect of *o,p'*-DDD (chlodithane) on secretion and metabolism of corticosteroids in chickens.]** *Fiziol. Zh. (Kiev) 17(4): 435-441; 1971.* (14 references) (Ukrainian)

Administration of *o,p'*-DDD (TDE) to chickens at 5 mg/kg body weight decreased the plasma corticosterone level (ACTH test) in comparison to that of a control group. The recovery of corticosterone in the liver was doubled. When the TDE dose was increased to 10-20 mg/kg or when the administration was continued for 20 days, the basal plasma corticosteroid level decreased. The plasma corticosteroid content one hour after ACTH administration to the TDE-treated chickens was considerably reduced compared to the control group. Corticosterone regeneration in the liver increased, but corticosterone recovery in the liver decreased after introduction of 20 mg of inhibitor. The transcortin binding capacity was not affected by TDE administration. Destructive-degenerative changes were observed in chicken adrenal cortex after administration of TDE. (From author summary)

73-2921. Khomenko, N. R. (Lab. Physiol., All-Union Inst. Hyg. Toxicol. Pestic. Polymers Plastic Materials, Kiev, USSR). **Zminy membrannoho potentsialu motoneyroniv spynnoho mozku shchuriv pid vplyvom sevinu ta chlorofosy. [Changes in the membrane potential of spinal motor neurons in rats under the influence of sevin and chlorofos.]** *Fiziol. Zh. (Kiev) 17: 527-528; 1971.* (7 references) (Ukrainian)

The influence of Sevin (carbaryl) and chlorofos (trichlorfon) on the changes in membrane potential of spinal motor neurons was investigated. Seven groups of white rats, eight rats per group, 250-300 g in weight, were used. The first group were used for controls; rats in groups 2 and 3 received one dose each of 425 mg/kg Sevin and 400 mg/kg trichlorfon; rats in groups 4 and 5 received doses of 42.5 mg/kg Sevin and 40.0 mg/kg trichlorfon daily for three months; rats in groups 6 and 7 received 8.0 mg/kg and 8.5 mg/kg doses of Sevin and trichlorfon respectively, daily for six months. Changes in membrane potential were monitored by oscillograph; 18-20 measurements of change in membrane potential were done on each animal. Membrane potential increased after ingestion of Sevin, the size of the increase depending on the dosage. Average membrane potential in the control group was 62.0 plus or minus 0.71 mv. An increase of 37.3% (85.2 plus or minus 0.23 mv) was noted in group two, in which the rats received one dose. An increase of 14.9% (71.3 plus or minus 0.58 mv) was noted in group four; and an increase of 4.9% (65.1 plus or minus 1.81 mv) was noted in group six. Membrane potential also increased after ingestion of trichlorfon: an increase of 33.3% (82.7 plus or minus 0.69 mv) in group three, an increase of 16.1% (72.1 plus or minus 0.95 mv) in group five, and a 6% increase (65.1 plus or minus 0.36 mv) in groups six and seven. The possible influence of potassium and sodium ions on changes in membrane potential was also considered.

73-2922. Komisarenko, V. P.; Reznikov, O. H.; Mikosha, O. S. (Inst. Endocrinol. Metab., Kiev, USSR). **Suchasni uyavlennya pro mekhanism diyi *o,p'*-DDD na funktsiyu kory nadnyrkovykh zaloz. [Modern ideas of the mechanism of *o,p'*-DDD effect on the adrenal cortex function.]** *Fiziol. Zh. (Kiev) 18(5): 579-584; 1972.* (27 references) (Ukrainian)

The results of various investigations and literature were considered concerning the mechanism of *o,p'*-DDD (TDE) on the adrenal cortex cells. TDE sharply inhibited secretion of corticosteroids and adrenal reaction to ACTH by way of a blocking of cholesterol transformation into pregnenolone as well as inhibition of the activity of 3-β-ol-steroid dehydrogenase, 11-β-, and 21-hydroxylases. Inhibition of hydroxylation reactions can possibly be connected with the reduced NADP deficiency. Mitochondria are most likely to be affected by *o,p'*-DDD in the adrenal cortex cells.

73-2923. Korpachev, V. V. (Inst. Endocrinol. Metab., Kiev, USSR). **Nakopychennya ta vyvedennya *o,p'*-DDD v orhanakh i tkanynakh morskykh svynok i sobak. [Accumulation and elimination of *o,p'*-DDD in organs and tissues of guinea pigs and dogs.]** *Fiziol. Zh. (Kiev) 18(5): 585-590; 1972.* (14 references) (Ukrainian)

The accumulation and elimination of *o,p'*-DDD (TDE) in organs and tissues were studied in guinea pigs and dogs. *o,p'*-DDD was given in doses of 25 and 50 mg/kg in each set of experiments. The greatest concentration of *o,p'*-DDD in the blood of dogs occurred 4 hr after administration. *o,p'*-DDD concentration in all other organs and tissue of guinea pigs and dogs peaked on the 10-20th days of the experiments with repeated doses, and then decreased although *o,p'*-DDD therapy was not discontinued. Elimination took place quickly from all the organs and tissues when therapy stopped. The preparation was retained longer in the adrenals and in adipose tissue than in other organs.

73-2924. Vanyurykhina, L. T. (Inst. Endocrinol. and Metab., Kiev, USSR). **Vplyv inhibitora funktsiyi kory nadnyrkovykh zaloz khlodytanu (*o,p'*-DDD) na bilky syrovatky krovi. [Effect of adrenal cortex function inhibitor chlodithane (*o,p'*-DDD) on blood serum proteins.]** *Fiziol. Zh. (Kiev) 18(5): 591-595; 1972.* (11 references) (Ukrainian)

Changes in blood serum proteins during the suppression of adrenal cortex function with *o,p'*-DDD (TDE) were studied in dogs. TDE was given at 25 and 50 mg/kg for 14 days. Serum proteins were investigated by electrophoresis and immunoelectrophoresis in agar gel before inhibitor administration and on the sixth, tenth, and fourteenth days after administration. The *o,p'*-DDD administration resulted in the development of pronounced dysproteinemia, characterized by an increase in total protein level, a decrease in albumin concentration, and an increase in globulin content, mainly of α_2, β_1, and γ-globulins. Immunopherograms of serum from treated dogs showed a considerable rise in intensity and density of precipitation bands corresponding to all three classes of immunoglobulins; the appearance of additional, intensive, dense precipitation bands corresponding to α_2 macroglobulin; and a decrease in precipitation peculiar to albumin. Comparison of the data obtained with earlier investigations and with literature data indicated that altered adrenal cortex function need not be considered as a main reason for changes in blood serum proteins under the influence of *o,p'*-DDD.

73-2925. Humiczewska, M.; Stanosz, S. (Dept. Biol., Inst. Biostructure, Pomeranian Med. Acad., Szczecin, Poland). **Influence of protracted administration of phenoxyacetic acid derivatives and nitrogranulogen on alkaline and acid phosphatase and succinic dehydrogenase activities in the liver of guinea pigs.** *Folia Morphol. (Warsaw) 32(1): 103-114; 1973.* (19 references)

Activity and, in some cases, distribution of three liver enzymes were altered by subcutaneous administra-

tion of phenoxyacetic acid derivatives and nitrogranulogen in pregnant female guinea pigs. Alkaline phosphatase was affected only by 2,4-D given at 30 mg/kg/day. The effects were an increase in activity and localization in liver cells. Nitrogranulogen and 2,4-D impaired acid phosphatase activity to about the same degree while MCPA had practically no influence on the activity of this enzyme. Succinic dehydrogenase activity was diminished most by MCPA, and some inhibition was observed with the low dose (15 mg/kg) of 2,4-D.

73-2926. Greig, J. B.; Jones, G.; Butler, W. H.; Barnes, J. M. (MRC Toxicol. Unit, Med. Res. Council Lab., Carshalton, Surrey, England). **Toxic effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Food Cosmet. Toxicol. 11(4): 585-595; 1973.* (30 references)

The toxic compound 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (dioxin) was shown to cause pericardial edema and death in chickens after a single oral dose of 25-50 μg/kg. The extreme toxicity of dioxin to the guinea pig was confirmed. Female rats given a single oral dose of 200 μg dioxin/kg had depressed food intake and weight loss. The mean time of their death was 40.4 days. The animals showed no consistent post-mortem appearance although gastric hemorrhage and jaundice were common. In the first 3 days after dosing there were significant changes in liver constitution, although there were no alterations in plasma components indicative of liver malfunction. The changes in blood cell counts, hematocrit, hemoglobin, and plasma protein levels 1 wk after dosing were most probably associated with the reduction in food intake. The liver showed pathological changes at later periods, in particular the formation of multinucleate parenchymal cells. (Author abstract by permission)

73-2927. Matveyeva, V. G.; Kerkis, Yu. Ya.; Osipova, L. P. (Inst. Cytol. Genet., Sib. Br. Acad. Sci. USSR, Novosibirsk, USSR). **Mutagennyy effekt DDB i khloridina v kostnom mozge i polovykh kletkakh myshey. [Mutagenic effect of DDB pesticide and chloridin in bone marrow and gametes of mice.]** *Genetika 9(2): 67-76; 1973.* (25 references) (Russian)

Mutagenic activity of 10 to 300 mg/kg oral doses of DDB and the antimalarial drug chloridin was studied in bone marrow and sex cells of 2.5-4 month old male mice. Single 100 mg/kg doses of both DDB and chloridin significantly increased the frequency of cells with chromosomal aberrations. The frequency reached a maximum between the 8th and 14th hours after administration of DDB and persisted for five days. In the treatment of spermatogonia, resting spermatocytes, middle pachynema, and diplonema, DDB exerted powerful mutagenic effect on diplonema. The analysis of diakinesis-metaphase I revealed a significant number of translocations, acentric fragments, and somatic univalents. The action of DDB on bone marrow and sex cells was correlated. The dose-effect curve plotted for 10-300 mg/kg doses of DDB shows an irregular S-shaped bend with maximum mutagenic effect at around 100 mg/kg.

73-2928. Paronikyan, G. M.; Akopyan, L. G. (Inst. Organ. Anal. Chem., Armenian SSR Acad. Sci., Yerevan, USSR). **Mutagennoye deystviye novykh khimicheskikh soyedineniy. Soobshcheniye II. Izucheniye mutagennogo deystviya proizvodnykh fenil- i fenoksiuksusnykh kislot. [Mutagenic effect of new chemical compounds. Part 2: Effect of phenyl- and phenoxyacetic acid derivatives.]** *Genetika 9(4): 78-84; 1973.* (9 references) (Russian)

The mutagenic effect of 45 new compounds was studied (urotropin salts and *S*-thiourea derived esters of substituted phenoxyacetic acids and substituted phenylacetic acids; hydrazides of 4-bromo-2-dialkylaminomethylphenoxyacetic acids; hydrazides of 4-alkoxy-3-diethylaminomethylphenylacetic acids; and hydrazone hydrazides of halogenated phenoxyacetic acids) on the biochemical mutants of *Escherichia coli* P-678, *Actinomyces rimosus* 222, and *Saccharomyces cerevisiae*. The most active compound was the hexamethylenetetramine salt of 2-chloromethyl-4-bromophenoxyacetic acid methyl ester which induced reversible mutations in the threonine locus with a frequency exceeding the control more than 27 times, in the lysine locus more than 13 times, and in the adenine locus more than 6 times. In addition, 11 more substituted esters of phenyl- and phenoxyacetic acid derivatives possessed varying degrees of mutagenic effect.

73-2929. Davydova, T. B. (Sverdlovsk Sci. Res. Inst. Maternity and Child Protect., Russian SSR Min. Pub. Health, Sverdlovsk, USSR). **Vliyaniye tetrametiltiuramdisul'fida na estral'nyy tsikl i detorodnuyu funktsiyu zhivotnykh pri ingalyatsionnom vozdeystvii. [The effect of tetramethylthiuramdisulfide (thiram) inhaled on the estrous cycle and the reproductive function of animals.]** *Gig. Sanit. 38(4): 108-110; 1973.* (3 references) (Russian)

The effect of thiram on the estrous cycle and the reproductive function of female albino rats was studied. The animals were exposed to thiram concentrations of 3.8±0.058 mg/m^3 6 hr a day, 5 days a week, for 4.5 months. Extension of the estrous cycle at the expense of the resting cycle was observed during the initial period of the experiments. The estrous cycle normalized again by the end of the experiment. The elongation of the estrous cycle was most pronounced in rats exposed to 3.8 mg/m^3 concentrations of thiram. Despite the normalization of the estrous cycle, impairment of the reproductive functions of the animals (reduced rate of conception, reduced fertility, and underweight fetuses) was evidenced.

73-2930. Aripdzhanov, T. M. (Tashkent Sci. Res. Inst. Vaccination and Serol., Tashkent, USSR). **Eksperi-**

mental'noye izucheniye vliyaniya antio i mil'beksa na immunobiologicheskuyu reaktivnost' i nekotoryye autoimmunnyye protsessy v organizme. [Experimental study of the effects of anthio and milbex on immunobiological reactivity and some autoimmune processes.] *Gig. Sanit. 38(5): 101-102; 1973.* (4 references) (Russian)

The effects of single 50, 100, 150, and 167.5 mg/kg doses of anthio (formothion) and 320, 620, 940, 1,400, and 1,750 mg/kg doses of milbex were studied in female goats. The doses were administered through gastric tube and the immunobiological reactivity and autoimmune processes studied. Anthio and milbex inhibited antibody formation and phagocytic activity of the neutrophilic leukocytes, and especially the clotting function. The bactericidal activity of the skin and blood considerably decreased during the first two months after poisoning, with normalization in the 3rd month. Circulating liver, kidney, stomach, and intestine autoantibodies were detected in the serum of poisoned animals during the first two months.

73-2931. Vorob'eva, N. M.; Lapchenko, V. S. (Kiev Sci. Res. Inst. Nutr. Hyg., Kiev, USSR). **O toksichnosti i gigiyenicheskom normirovanii pestitsida tsiodrina. [Toxicity and hygienic standardization of the pesticide ciodrin.]** *Gig. Sanit. 38(6): 30-33; 1973.* (1 reference) (Russian)

The toxicity of orally administered ciodrin (crotoxyphos) was studied in acute poisoning tests on albino mice, rats, and cats in 4-month subchronic experiments, and in 10-month chronic experiments on albino rats. The respective LD50 values determined for male rats, mice, and cats were 38.4±7.8 mg/kg, 39.8±10.6 mg/kg, and 802±9.02 mg/kg. A weak cumulative property of crotoxyphos was determined in subchronic experiments. Daily 3.84, 1.92, and 0.77 mg/kg doses did not cause death, but led to reduced cholinesterase levels, leucocytosis, increased vitamin C levels in the liver and kidney, and reduced rate of hippuric acid synthesis. Similar changes, as well as more or less pronounced reduction of the eosinophilic cell counts in the hypophysis and adrenal cortex, increased vitamin C content in the adrenal gland, and elevated blood sugar level were observed in rats fed daily 0.25 and 0.05 mg/kg doses of crotoxyphos for 10 months. Another 0.01 mg/kg dose proved ineffective and was retained as a threshold dose. The maximum allowable crotoxyphos residue concentration in meat was set at 0.005 mg/kg; milk and dairy products are not allowed to contain crotoxyphos residue.

73-2932. Aripdzhanov, T. M. (Tashkent Sci. Res. Inst. Vaccin. Serol., Tashkent, USSR). **Vliyaniye pestitsida antio i mil'beksa na immunologicheskuyu reaktivnost' i nekotoryye autoimmunnyye protsessy v organizme. [Effect of pesticides anthio and milbex on the immunologic reactivity and certain autoimmune processes of the body.]** *Gig. Sanit. 38(7): 39-42; 1973.* (3 references) (Russian)

The effects of anthio (formothion) and milbex were studied on the immunological reactivity and autoimmune processes of goats fed 1/100, 1/500, and 1/1,000 of the respective LD50 of formothion (175 mg/kg) and milbex (2,100 mg/kg) for 90 days. Both pesticides caused changes in the immunological reactivity, which manifested themselves in increased immunogenesis during the first 30 to 45 days of the poisoning and in the subsequent inhibition of the immunogenesis. The agglutinin titers in the test animals were lower than those in a control group during the entire experiment. The long-term poisoning for 90 days led to steady inhibition of the phagocytic activity of the neutrophils in comparison with the control group. Autoimmune processes, characterized by the presence in the blood of autoantibodies, developed during the 90-day experiment.

73-2933. Kagan, Yu. S.; Sasinovich, L. M.; Ovseyenko, G. I. (Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Ispol'zovaniye korrelyatsionnogo analiza pokazateley toksichnosti i kumulyatsii dlya gigiyenicheskogo normirovaniya pestitsidov v vozdukhe rabochey zony (s primeneniyem elektronnovychislitel'nykh mashin). [Correlation analysis of the toxicity and cumulation indices for setting hygienic standards of the pesticides content in the atmosphere of a working place area (by using computers).]** *Gig. Tr. Prof. Zabol. 16(8): 21-25; 1972.* (11 references) (Russian)

Paired and multifactorial correlations between pesticide toxicity and cumulation indices and the maximum permissible concentrations in workplace atmosphere were studied with a computer to determine the data most useful in establishing permitted exposure levels. For strong and medium strong correlations a regression equation was derived. Strong to moderately strong correlations were found using Student's *t*-test between LD50 and the maximum permissible concentration with a correlation factor of 0.56; between Lim(chronic) and maximum permissible concentration with a factor of 0.98; and between the cumulation coefficient and the safety factor for transition from Lim(chronic) to maximum permissible concentration with a factor of 0.65. Multifactorial correlations were established between maximum permissible concentration and factors that exhibited strong linkage in paired correlations, such as LD50 and cumulation factor. The relative error involved in the determination of the maximum allowable concentration from the LD50 and the cumulation factor was 34%. Nomograms permitting approximate determination of the maximum allowable concentration without resorting to mathematical calculations were plotted. Adequate agreement between estimated and empirical data permits the use of the recommended formulae and nomograms in estimating

the maximum allowable workplace concentrations of pesticides.

73-2934. Nestor, I. (Pub. Health and Med. Res. Inst., Cluj, Rumania). **Influenta insecticidelor organfosforice de tip Malathion si Bromofos asupra unor bacterii gram-pozitive. [The action of organophosphate insecticides of the malathion or bromophos type on some gram-positive bacteria.]** *Igiena 20(12): 723-730; 1971.* (9 references) (Rumanian)

The effects of malathion and bromophos on the growth of gram-positive bacteria such as *Streptococcus faecalis, Staphylococcus aureus,* and *Bacillus anthracis* in broth culture media and their persistence in tap water were studied. Related data was compared to similar studies performed with gram-negative bacteria such as *E. coli* and *Aerobacter aerogenes.* All gram-positive strain growth was inhibited by 5 to 50 and 100 μg/ml insecticide doses. Bacteriostatic effects resulted from 200 μg/ml of insecticide. Bacteriostatic doses coincided with bactericidal doses in most cases. Gram-positive bacteria were more susceptible to the insecticide than the gram-negative species. Survival of *E. coli* and *A. aerogenes* was shorter in water samples containing 10 and 100 mg/l. of either insecticide. Both malathion and bromophos could interfere with the water self-purification processes when present in amounts exeeding 5 to 10 mg/l.

73-2935. Ramachandran, B. V.; Patil, B. G. (Nat. Chem. Lab., Poona 8, India). **Effect of diisopropyl phosphorofluoridate & paraoxon in vivo & in vitro on the sodium & potassium contents of mouse liver tissue.** *Indian J. Exp. Biol. 10(3): 371-374; 1972.* (25 references)

DFP and paraoxon, administered to mice at doses approximately equal to the LD50, significantly decreased the Na content of the liver within 30 min. Potassium content was not affected in either case. Pretreatment with atropine 15 min prior to organophosphate administration did not abolish the effect. The moisture content of the liver tissue was also significantly reduced, suggesting that the decrease in Na was a result of the efflux of Na and water from the inside of the cell to the outside. Paraoxon and DFP also reduced the Na content of slices of liver tissue incubated in Krebs–Ringer bicarbonate solution. The effect observed was probably not due to the anti-AChE activity of the compounds since eserine, ACh, and BuCh had no effect on Na or K in liver tissue.

73-2936. Kovacs, J.; Vincze, I.; Ali Haroun, I. (Cent. Inst. Food Control. and Chem. Anal., Budapest, Hungary). **Szen 14-gyel jelzett herbicidek hatasanak es bomlasanak vizsgalata szololevelen es algan. [Study of the effect and metabolism of ^{14}C-labeled herbicides in grape leaves and algae.]** *Izotoptechnika 16(2): 79-83; 1973.* (4 references) (Hungarian)

Autoradiography and TLC were used to study the uptake and metabolism of ^{14}C-labeled 2,4,5-T and 2,4,5-TE (2,4,5-trichlorophenoxyethanol) by excised grape leaves and *Chlamydomonas Reinhardti* No. 90 minus cultures. The rate of pesticide uptake through the leaf stem steadily increased during the first 12 hours. A subsequent decrease in the rate of uptake and even some back-flow of the herbicides from the leaves were observed. The inhibition of algal growth, a measure of herbicide uptake, amounted to 55% at a 2,4,5-T concentration of 0.025 g/l. While the rate of metabolism of the ^{14}C-labeled herbicides in grape leaf and algal homogenates was rather low, metabolites were readily detected. The nature of these metabolites is being studied. Both 2,4,5-T and 2,4,5-TE inhibited photosynthesis.

73-2937. Black, A. L.; Chiu, Y.; Fahmy, A. H.; Fukuto, T. R.* (Dept. Chem., Univ. California, Riverside, CA 92502). **Selective toxicity of *N*-sulfenylated derivatives of insecticidal methylcarbamate esters.** *J. Agr. Food Chem. 21(5): 747-751; 1973.* (20 references)

An investigation of the toxicological properties of a series of *N*-arylsulfenyl and *N*-alkylsulfenyl derivatives of several commercial methylcarbamate insecticides has been carried out. Compared to the parent insecticides, the derivatives display significantly reduced toxicity to the white mouse, and *S*-aryl derivatives are less toxic to the mammal than the alkylsulfenamides. All of the derivatives were more effective as mosquito larvicides than the parent methylcarbamates, and many compounds were highly toxic to houseflies. Toxicity to houseflies was enhanced by the synergist piperonyl butoxide. The selective toxicity of the *N*-sulfenylated carbamates is not directly related to anticholinesterase activities. (Author abstract reprinted by permission of the American Chemical Society)

73-2938. Wustner, D. A.; Fukuto, T. R. (Dept. Entomol., Div. Toxicol. Physiol., Univ. California, Riverside, CA 92502). **Stereoselectivity in cholinesterase inhibition, toxicity, and plant systemic activity by the optical isomers of *O*-2-butyl *S*-2-(ethylthio)ethyl ethylphosphonothioate.** *J. Agr. Food Chem. 21(5): 756-761; 1973.* (22 references)

The synthesis and resolution of *O*-2-butyl *S*-2-(ethylthio)ethyl ethylphosphonothioate (demeton analog), optically active at both the 2-butyl carbon and at phosphorus, are described. Also synthesized were the racemic *O*-2-butyl *S*-2-(ethylsulfinyl)ethyl ethylphosphonothioate (sulfoxide), *O*-2-butyl *S*-2-(ethylsulfonyl)ethyl ethylphosphonothioate (sulfone), and *O*-2-butyl *S*-2-(dimethylamino)ethyl ethylphosphonothioate (tetram analog). The levorotatory phosphorus isomers gave bimolecular inhibition rate constants 1250-, 105-, and 36-fold larger than corresponding dextrorotatory phosphorus enantiomers against housefly

head acetylcholinesterase, bovine erythrocyte acetylcholinesterase, and horse serum cholinesterase, respectively. The levorotatory phosphorus isomers were much more active as toxicants to susceptible and resistant houseflies, *Culex* mosquito larvae, and mice than the dextrorotatory compounds. The dextrorotatory enantiomers were completely inactive as systemic insecticides in cotton plants, while the levorotatory isomers were highly active both as stem and soil treatments. It is apparent that toxicity and plant systemic insecticidal effectiveness are directly related to anticholinesterase activity. (Author abstract reprinted by permission of the American Chemical Society)

73-2939. Harvey, Jr., J.; Jelinek, A. G.; Sherman, H. (Biochem. Dept., E. I. du Pont de Nemours Co., Inc., Wilmington, DE 19898). **Metabolism of methomyl in the rat.** *J. Agr. Food Chem. 21(5): 769-775; 1973.* (4 references)

Radiolabeled methomyl was administered orally to rats. Essentially all of the radioactivity was rapidly eliminated from the animal body within 24 hr in the ratio of 1 part [^{14}C]carbon dioxide, 2 parts [1-^{14}C] acetonitrile, and 1 part urinary metabolites. Although the chemical identity of the polar radiolabeled material excreted in the urine has not been established, the absence of methomyl, *S*-methyl *N*-hydroxythioacetimidate, the *S*-oxide of methomyl, and the *S,S*-dioxide of methomyl and conjugates thereof has been demonstrated. The synthesis of these compounds is described. (Author abstract reprinted by permission of the American Chemical Society)

73-2940. Harvey, Jr., J.; Reiser, R. W. (Biochem. Dept., E. I. du Pont de Nemours Co., Inc., Wilmington, DE 19898). **Metabolism of methomyl in tobacco, corn, and cabbage.** *J. Agr. Food Chem. 21(5): 775-783; 1973.* (7 references)

The metabolic fate of methomyl was investigated in tobacco, corn, and cabbage in the laboratory and greenhouse. Plants treated with radiolabeled methomyl rapidly degraded the compound to [^{14}C]carbon dioxide and [1-^{14}C]acetonitrile, which volatilized from the plant tissues. The half-life for methomyl was on the order of 3 to 6 days. The remainder of the ^{14}C activity had been reincorporated into natural plant components after total decomposition of the methomyl molecule. Radiolabeled lipids, Krebs cycle acids, sugars, and a multiplicity of ^{14}C products have been identified or detected. No evidence was found for the presence of either the *S*-oxide or *S,S*-dioxide of methomyl itself. The laboratory studies were extended to season-long treatment of corn and cabbage in the field with radiolabeled methomyl with similar results. (Author abstract reprinted by permission of the American Chemical Society)

73-2941. Still, G. G.; Mansager, E. R.* (U. S. Dept. Agr., Metab. Radiat. Res. Lab.,Fargo, ND 58102). **Metabolism of isopropyl-3-chlorocarbanilate by cucumber plants.** *J. Agr. Food Chem. 21(5): 787-791; 1973.* (11 references)

Root-treated cucumber plants absorb, translocate, and metabolize ^{14}C-labeled isopropyl-3-chlorocarbanilate (chlorpropham-^{14}C). Polar products and solid residues are found in the roots, stems, and leaves after a 3-day treatment period. Pulse time-course experiments demonstrate a precursor-product relationship between chlorpropham, soluble polar products, and solid residual materials. The polar metabolites are not translocated once they are formed in either the roots or shoots. The radiocarbon distribution patterns of phenyl-^{14}C and isopropyl-^{14}C-labeled chlorpropham were similar in all comparative experiments. Polar metabolites were isolated and partly purified, and the chlorpropham oxidized moiety was characterized. Cucumber tissues rapidly convert chlorpropham to isopropyl-4-hydroxy-3-chlorocarbanilate, which is conjugated with unknown plant components. These chlorpropham metabolites were found in both root and shoot tissues. (Author abstract reprinted by permission of the American Chemical Society)

73-2942. Dorough, H. W.; Whitacre, D. M.; Cardona, R. A. (Dept. Entomol., Univ. Kentucky, Lexington, KY 40506). **Metabolism of the herbicide methazole in cotton and beans, and fate of certain of its polar metabolites in rats.** *J. Agr. Food Chem. 21(5): 797-803; 1973.* (8 references)

Methazole was metabolized by cotton and beans to 3-(3,4-dichlorophenyl)-1-methylurea and 3-(3,4-dichlorophenyl)urea. These metabolites occurred in the free form and as polar products which were converted to the free form by acid treatment. ^{14}C residues in the solids after acetone extraction were removed by heating in 1 *N* HCl and extracting with ethyl acetate. The methylurea and urea derivatives of methazole were the major components of the ethyl acetate extract. When polar acetone-extractable metabolites from cotton and beans were administered orally to rats, 70 to 80% of the radioactivity was excreted within 24 hr. Residues were low, 0.13 ppm maximum, in tissues of animals sacrificed 12 hr after treatment orally for 14 days with polar methazole metabolites at a rate of approximately 1 μg of methazole-^{14}C equivalents/animal/day. (Author abstract reprinted by permission of the American Chemical Society)

73-2943. Paulson, G. D.; Jacobsen, A. M.; Zaylskie, R. G.; Feil, V. J. (U. S. Dept. Agr., Metab. Radiat., Res. Lab., Fargo, ND 58102). **Isolation and identification of propham (isopropyl carbanilate) metabolites from the rat and the goat.** *J. Agr. Food Chem. 21(5): 804-811; 1973.* (14 references)

Rats and a goat were each given a single dose (100 mg/kg body wt) of isopropyl carbanilate[phenyl-^{14}C (U)]. The primary route of elimination of ^{14}C was via the urine, with smaller amounts appearing in the feces and milk (goat). Goat urinary metabolites included the sulfate ester of isopropyl 4-hydroxycarbanilate, the glucuronic acid conjugate of isopropyl 4-hydroxycarbanilate, another conjugated form of isopropyl 4-hydroxycarbanilate, a conjugate of isopropyl 3,4-dihydroxycarbanilate, the sulfate ester of isopropyl 2-hydroxycarbanilate, a conjugate of 4-hydroxyaniline, the sulfate ester of 2-hydroxyaniline, another conjugated form of 2-hydroxyaniline, the glucuronic acid conjugate of 4-hydroxyacetanilide, a conjugate of (2-hydroxyisopropyl)-4-hydroxycarbanilate, and several other minor unidentified radiolabeled compounds. Rat urinary metabolites included the sulfate ester of isopropyl 4-hydroxycarbanilate, the glucuronic acid conjugate of isopropyl 4-hydroxycarbanilate, the sulfate ester of 4-hydroxyacetanilide, and several other minor unidentified radiolabeled compounds. (Author abstract reprinted by permission of the American Chemical Society)

73-2944. Karapally, J. C.; Saha, J. G.*; Lee, Y. W. (Res. Sta., Can. Dept. Agr., Univ. Campus, Saskatoon, Saskatchewan, Canada). **Metabolism of lindane-^{14}C in the rabbit: ether-soluble urinary metabolites.** *J. Agr. Food Chem. 21(5): 811-818; 1973.* (23 references)

Uniformly labeled lindane-^{14}C (2.04 g) in gelatin capsules was fed to five rabbits over a period of 26 weeks. By the end of the feeding period, 54% of the administered radioactivity had been excreted in the urine and 13% in the feces. About 56% of the urinary metabolites were soluble in ether. From the ether-soluble urinary metabolites 2,3,5-, 2,4,5- and 2,4,6-trichlorophenol and 2,3,4,6-tetrachlorophenol were identified by comparing infrared spectra of the isolated chlorophenols and/or their anisole derivatives with those of the reference compounds. Three other metabolites, 2,3- and 2,4-dichlorophenol and 2,3,4,5-tetrachlorophenol, were identified by the gas chromatographic retention times and their mass spectra. Seven more chlorophenols and six chlorobenzenes were tentatively identified by their gas chromatographic retention times. These metabolites were: 2,5-, 2,6-, and 3,4-dichlorophenol, 2,3,4-, 2,3,6-, and 3,4,5-tetrachlorophenol, pentachlorophenol, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, 1,2,3,4-, 1,2,4,5-, and/or 1,2,3,5-tetrachlorobenzene, and pentachlorobenzene. (Author abstract reprinted by permission of the American Chemical Society)

73-2945. Talekar, N. S.; Lichtenstein, E. P.* (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706). **Influence of mineral nutrients on the penetration, translocation, and metabolism of (^{14}C)Dyfonate in pea plants.** *J. Agr. Food Chem. 21(5): 851-855; 1973.* (10 references)

The effects of mineral nutrient deficiencies on the penetration, translocation, and metabolism of [^{14}C](ethoxy)Dyfonate in pea plants were investigated. With plants grown in nitrogen-deficient nutrient solutions, the penetration of radiocarbon into roots increased by 61%, while the translocation into greens was not affected. Deficiencies of potassium, calcium, and magnesium resulted in reduction of ^{14}C into the roots by 48, 61, and 58%, respectively, while potassium deficiency caused an 80% increase in translocation. In roots, 81-91% of the recovered radiocarbon was associated with organic solvent phase, while in the greens these phases contained only 10-16%. Conversely, only 8 to 11% of the total ^{14}C recovered from roots and 48 to 71% from greens was associated with the water phase. The amounts of unextractable radioactivity in the roots were relatively small (1 to 6% of the total recovered), while in the greens these figures were 19 to 47%. Nutrient deficiencies affected the production of water-soluble metabolites and the amounts of unextractable radioactivity. Concentrations of Dyfonate in control roots amounted to 80.2 ppm and of Dyfoxon was 0.87 ppm. In the greens these concentrations were considerably lower, but the amounts of Dyfoxon in the greens relative to the amounts of Dyfonate were much larger. A lack of nitrogen or sulfur resulted in the presence of higher concentrations of Dyfonate in the roots, while deficiencies in potassium, calcium, or magnesium caused significant decreases in concentrations of both Dyfonate and Dyfoxon in roots. Concentrations of Dyfoxon in greens were reduced due to deficiencies of all elements except nitrogen. (Author abstract reprinted by permission of the American Chemical Society)

73-2946. Schechter, R. D.; Stabenfeldt, G. H.; Gribble, D. H.; Ling, G. V. (Dept. Clin. Sci., Sch. Vet. Med., Univ. California, Davis, CA 95616). **Treatment of Cushing's syndrome in the dog with an adrenocorticolytic agent (*o,p'*-DDD).** *J. Amer. Vet. Med. Ass. 162(8): 629-639; 1973.* (27 references)

An adrenocorticolytic agent (*o,p'*-DDD, TDE) was given orally to treat 18 dogs with Cushing's syndrome for a period of three years. Diagnosis was based on clinical, laboratory, and endocrinologic findings. Response to *o,p'*-DDD therapy was excellent in 13 dogs, 9 of which are presently alive, with complete remission of clinical signs; the first dog treated with *o,p'*-DDD is still alive and well three years later. Of two dosage schedules evaluated, an initial daily dosage schedule of 4 to 13 days followed by a once weekly dose of *o,p'*-DDD resulted in the longest remission periods; none of the dogs thus treated has relapsed. The only side effects that could be directly related to the use of *o,p'*-DDD were depression and anorexia in a few dogs. These effects were completely reversible on discontinuance of treatment. None of the dogs treated has ever developed clinical or laboratory evidence of adrenal insufficiency

despite the development of low plasma corticosteroid concentrations in most of them. Serious hepatic toxicosis due to *o,p'*-DDD therapy could not be detected by SGPT or bromsulfalein tests. Autopsy revealed specific cytotoxic changes only in the adrenal cortex: these were most extensive in the zona reticularis and zona fasciculata, but were limited in the zona glomerulosa. (Author abstract by permission, abridged)

73-2947. DeNorscia, R. M.; Lodge, J. R. (Univ. Illinois, Urbana, IL). **Dietary carbaryl and reproduction in mice.** *J. Anim. Sci. 37(1): 243-244; 1973.*

Significant differences in percent females becoming pregnant, the average litter size, and the average number liveborn were not observed between control mice and mice treated with carbaryl at dietary levels up to 2000 ppm. The first generation was fed the spiked diet until three litters were produced. Random pairs from the first litter were fed the diet until two litters were produced. In both generations almost 100% of the females became pregnant, litter size was generally between 7 and 8, and the average number of liveborn was between 7 and 8.

73-2948. Fisher, H. K.; Clements, J. A.; Wright, R. R. (Cardiovascular Res. Inst., Univ. California, San Francisco, CA 94122). **Pulmonary effects of the herbicide paraquat studied 3 days after injection in rats.** *J. Appl. Physiol. 35(2): 268-273; 1973.* (26 references)

A study of the lungs of rats three days after a single injection of paraquat (27 mg/kg) confirmed that atelectasis characteristic of paraquat intoxication is associated with abnormal behavior of the lung surfaces and a reduction of alveolar sufactant. Lung air deflation pressure-volume diagrams were shifted to the right by an average of 6.4 cm H_2O at half-maximal volume. No detectable surface active material was recovered from paraquat-treated animals while lung lavage fluid from control rats contained more than 5 μg/kg. Animals which were still alive at three days lost 11.6% of their body weight, and lung weights increased from 5.25 to 11.29 mg/kg. A 27% decrease in fully saturated lecithins of the lung was observed, an amount which could account for the loss of alveolar stability if it occurred in the alveolar pool and in a small intracellular pool of dipalmitoyl lecithin. Lung edema also observed in this study might have contributed to the increase in alveolar surface forces.

73-2949. Taylor, Jr., T. E.; Fisher, H. W. (Biophysics Lab., Univ. Rhode Island, Kingston, RI). **Ultrastructural changes in cells treated with toxic chemicals in culture.** *J. Cell. Biol. 55(2 Pt. 2): 257A; 1972.*

An electron microscopic examination of the ultrastructure of mammalian cells exposed to rotenone revealed a rather specific destruction of the matrix and cristae of the mitochondria. The effect on mitochondria was directly correlated with the dose which was lethal to the cells. The dose was close to that used to block the DPN link in the electron transport in isolated mitochondria. Cadmium, tested in the same manner, caused no specific changes in the ultrastructure of the cells until the dose was much higher than the lethal dose.

73-2950. Carey, R. M.; Orth, D. N.; Hartmann, W. H. (Dept. of Med. Pathol., Vanderbilt Univ. Sch. of Med., Nashville, TN 37232). **Malignant melanoma with ectopic production of adrenocorticotropic hormone: palliative treatment with inhibitors of adrenal steroid biosynthesis.** *J. Clin. Endocrinol. Metab. 36(3): 482-487; 1973.* (22 references)

Severe Cushing's syndrome and recurrent malignant melanoma developed in a 56-yr-old woman three years after the removal of the primary lesion, a pigmented mole on the dorsum of her right forearm. She had elevated plasma cortisol levels which did not show normal diurnal rhythm. Neither these nor her elevated urinary steroid excretion were suppressed by administration of high doses of dexamethasone (2 mg every 6 hr). Plasma immunoreactive ACTH levels were markedly elevated. Bioactive and immunoreactive ACTH was present in the metastatic tumor tissue. The patient who was moribund from the effects of severe hypercortisolism was cured of her Cushing's syndrome by the combined administration of aminoglutethimide and metyrapone. Due to severe drowsiness aminoglutethimide was replaced by TDE, 4 g/day. She was dramatically improved clinically despite steady progression of tumor growth. It appears that the use of TDE, especially in combination with inhibitors of adrenal steroid biosynthesis, is an effective means for correcting hypercortisolism in patients with ectopic ACTH syndrome.

73-2951. Hellman, L.; Bradlow, H. L.; Zumoff, B. (Inst. Steroid Res., Montefiore Hosp. Med. Cent., Bronx, NY 10467). **Decreased conversion of androgens to normal 17-ketosteroid metabolites as a result of treatment with *o,p'*-DDD.** *J. Clin. Endocrinol. Metab. 36(5): 801-803; 1973.* (8 references)

Studies in three patients with metastatic adrenal carcinoma and one patient with pernicious anemia showed that *o,p'*-DDD (TDE) markedly decreased conversion of labeled androgens to androsterone and etiocholanolone, with an increased conversion to unidentified polar metabolites. The decrease was about 80% for etiocholanolone and 76% for androsterone whether the dose was 7 g over 14 days, as with the pernicious anemia patient, or 105-196 g over 3 to 4 wk, as with the patients with adrenal carcinoma. The larger doses also decreased the formation of glucuronide conjugates and the total recovery of radioactivity in the urine. The main effect on androgen metabolism was

similar to that reported as a "nonspecific illness" effect and could be a result of stimulation of microsomal oxidase activity by the drug.

73-2952. Werner, R. A. (Southeastern Forest Exp. Sta., Forest Serv., U. S. Dept. of Agr., Research Triangle Park, NC 27709). **Absorption, translocation, and metabolism of root-absorbed ^{14}C-Monitor in loblolly pine seedlings.** *J. Econ. Entomol. 66(4): 867-872; 1973.* (7 references)

^{14}C-Monitor was readily absorbed by the roots of 55- and 155-day-old *Pinus taeda* L. seedlings and translocated to the needles within 6 hours of continuous uptake. Vermiculite-grown seedlings absorbed a significantly greater percentage of the radioactive Monitor than nutrient solution-grown seedlings. The higher water content of the nutrient-grown seedlings probably accounted for the difference in the rate of absorption. In addition to Monitor, *O,S*-dimethyl thiophosphoric acid and two radioactive unknowns were detected. Bioassay of seedlings with pales weevils, *Hylobius pales* (Herbst), indicated that Monitor was present in the needles in insecticidally active quantities following six hours of treatment. (Author abstract by permission)

73-2953. Miura, T.; Takahashi, R. M. (Mosquito Control Res. Lab., Univ. of California, Fresno, CA). **Insect developmental inhibitors. 3. Effects on nontarget aquatic organisms.** *J. Econ. Entomol. 66(4): 917-922; 1973.* (14 references)

Acute, short-term toxicity of ZR-515 (isopropyl 11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate) on various aquatic organisms was studied. In the laboratory, 35 organisms, including Protozoa, Platyhelminthes, Rotatoria, Annelida, Arthropoda, Mollu[illegible], Chordata, and Thallophyta were tested with technical ZR-515. Dosages used for mosquito larvae control produced no adverse effect on most of the organisms tested. In the field (artificial containers, ponds, and irrigated pastures), a slow-release formulation was used with no visible effect on most of the nontarget organisms. However, larvae of aquatic Diptera (Chironomidae, Ephydridae, Psycodidae) showed some sensitivity. (Author abstract by permission)

73-2954. Olson, L. E.; Marking, L. L. (Fish Control Lab., La Crosse, WI 54601). **Toxicity of TFM (lampricide) to six early life stages of rainbow trout (*Salmo gairdneri*).** *J. Fish. Res. Bd. Can. 30(8): 1047-1052; 1973.* (18 references)

The lampricide TFM (3-trifluoromethyl-4-nitrophenol) was tested against the following life stages of rainbow trout (*Salmo gairdneri*): green eggs, eyed eggs, sac fry, swim-up fry, fry, and fingerlings in four water hardnesses (12, 44, 170, and 320 mg/liter as $CaCO_3$). The eyed-egg stage was one of the most resistant stages tested, and the sac-fry stage was one of the least resistant. Increased water hardness decreases toxicity to all stages. The LC50s range from 0.532 mg/liter to 40.0 mg/liter depending upon life stage, water hardness, and duration of exposure. The margin of safety for coexisting species exposed to TFM ranges from 3.2 to 4.1 in natural waters. The margin of safety for early life stages of rainbow trout and larval lamprey under controlled laboratory conditions ranges from 4.2 to 12.2. Therefore, all six early life stages of rainbow trout are safe in minimum lampricidal concentrations of TFM. (Author abstract by permission)

73-2955. Peterson, R. H. (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, New Brunswick, Canada). **Temperature selection of Atlantic salmon (*Salmo salar*) and brook trout (*Salvelinus fontinalis*) as influenced by various chlorinated hydrocarbons.** *J. Fish. Res. Bd. Can. 30(8): 1091-1097; 1973.* (14 references)

The effects of previous exposure to *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDD (TDE), *p,p'*-DDE, and methoxychlor on temperature selection by juvenile Atlantic salmon (*Salmo salar*) in a horizontal temperature gradient were similar. Exposure to low concentrations resulted in no change or a decrease in selected temperatures as compared to control values of about 16°C. Exposure to higher concentrations raised selected temperatures. The concentrations of the substances required to produce a given effect varied as: *p,p'*-DDT $\geq$ *p,p'*-DDD $>$ methoxychlor $>$ *o,p'*-DDT $>$ *p,p'*-DDE. Exposure levels of *p,p'*-DDA $\leq$ 8 ppm did not alter temperature selection nor did exposure to Aroclor 1254, a polychlorinated biphenyl (PCB) preparation,at 2 ppm. Aldrin lowered temperature selection at 0.1-0.15 ppm. In a vertical gradient brook trout (*Salvelinus fontinalis*) previously exposed to *p,p'*-DDT and *p,p'*-DDD selected higher temperatures than controls. (Author abstract by permission)

73-2956. Trudgill, P. W.; Bowering, S. R. H. (Dept. Biochem. Agr. Biochem., Univ. College Wales, Aberystwyth, SY23 3DD Wales). **Accumulation of [^{14}C]aldrin by organochlorine insecticide sensitive and resistant bacteria.** *J. Gen. Microbiol. 73: 577-580; 1972.* (9 references)

All 11 organochlorine-sensitive Gram-positive and Gram-variable bacteria grown on medium containing ^{14}C-aldrin at subinhibitory concentrations accumulated some or all of the radioactivity at the surface of the agar. Most of the organochlorine insecticide-resistant Gram-negative bacteria did not accumulate any radioactivity although weak accumulation was noted with *Pseudomonas aureofaciens* and *P. dehalogens*. It is probable that the more highly organized structure of the Gram-negative cell wall effectively excludes the organochlorine insecticide, rendering the organism resistant, but *Staphylococcus aureus, Sarcina lutea*, and *Arthrobacter simplex*, which accumulate detectable amounts of aldrin, are not inhibited by aldrin.

73-2957. Kortus, J.; Krcmery, V.; Mayer, J.; Janovicova, J. (Res. Inst. Hyg., Bratislava, Czechoslovakia). **The inhibitory effect of imidane on the incorporation of ^{14}C-glutamic acid, ^{14}C-phenylalanine and ^{14}C-adenine into proteins and nucleic acids in *Escherichia coli* B.** *J. Hyg. Epidemiol. Microbiol. Immunol. 16(3): 325-327; 1972.* (5 references)

Imidan (phosmet), at concentrations from 5 to 200 μg/ml, inhibited the uptake of labeled glutamic acid and phenylalanine by *E. coli.* At 100 μg/ml uptake of these two compounds was about 20% of normal (during logarithmic phase of growth). Even high concentrations of imidan did not affect the uptake of adenine by *E. coli.* An imidan blockade of a transport mechanism or an effect in the region of peptidases and proteinases which are involved in the synthesis of proteins may be responsible for the results, but an inhibitory effect at the level of ribosomes is not excluded.

73-2958. Grifantini, M.; Martelli, S.; Stein, M. L.* (Inst. Pharm. Toxicol. Chem., Univ. Naples, Naples, Italy). **Structure-activity relationships in reactivators of organophosphorus-inhibited acetylcholinesterase. 6. 2-Hydroxyiminomethylimidazolium iodides.** *J. Med. Chem. 16(8): 937-939; 1973.* (5 references)

AChE inhibition by DFP in vitro was reversed with addition of *N*-benzyl substituted imidazoles or *N*-methyl substituted imidazoles, the former being the most active series of reactivators. In both series the best reactivator was also the least active inhibitor of AChE. The similar variation in the reactivator and inhibitor curves suggests that both groups of quaternary salts are bound to the anionic active site with a similar molecular orientation.

73-2959. Konat, G. (Neurochem. Inst., 58 Raadmandsgade, 2200 Copenhagen, Denmark). **Endogenous microsomal phospholipid peroxidation in mouse brain.** *J. Neurochem. 20: 1247-1256; 1973.* (34 references)

DDT inhibited lipid peroxidation of mouse brain microsomes. A maximum inhibition of 28% was attained at 3×10^{-2} m*M*, suggesting that the pesticide, which probably acts by absorbing on the membrane, cannot modify all phospholipid molecules undergoing peroxidation. Peroxidation did not take place with pure microsomes unless deproteinized supernatant of the brain was added. The activity was abolished by boiling or by incubation with phospholipase A. Liver and brain microsomal peroxidation differed both qualitatively and quantitatively.

73-2960. Anees, M. A. (Dept. Zool., Univ. Panjab, New Campus, Lahore, Pakistan). **Pesticides and human health.** *J. Pak. Med. Ass. 22(11): 303-314; 1972.* (97 references)

A selective survey of the literature concerning toxicity and pathology induced in man and other mammals by organochlorines and organophosphates shows that intensive research is needed in the areas of their mechanisms of action, effects on aging and disease resistance, interaction with other environmental factors, and carcinogenic and mutagenic potential. Clinical manifestations of organochlorine poisoning include coma, hyperpyrexia, nausea, vomiting, convulsion, tremor, and vertigo. Neurotoxic effects on the central and peripheral nervous systems, liver disorders, metabolic effects, histological changes, and carcinogenic effects have been observed in man or animals exposed to organochlorines. Organophosphates inhibited central and peripheral ChE, exerting a general cholinergic action. In man mental disorders, impotence, cardiac changes, and ocular symptoms have been attributed to these insecticides. Similar effects, as well as biochemical alterations, have been observed in animals.

73-2961. Mayer, O.; Eybl, V. (Pharmacol. Dept., Med. Fac. Charles Univ., Plzen, Czechoslovakia). **Dithiocarbamate central effects in relation to their possible influence on drug metabolizing enzymes.** *J. Pharm. Pharmacol. 25(8): 672-675; 1973.* (20 references)

Dimethyldithiocarbamate (dibam) and disulfiram at 150 mg/kg depressed the exploratory activity of rats. Animals given 5 mg/kg amphetamine 90 min after dimethyldithiocarbamate had decreased exploratory activity and increased performance of sterotyped movements induced by amphetamine. Disulfiram at 3 mg/kg did not potentiate the effect of amphetamine on behavior. Pentobarbitone sleeping time was approximately doubled in mice given diethyldithiocarbamate (DEDTC) at 100 mg/kg; barbiturate sleeping time shortened by spironolactone pretreatment was partially restored to normal by DEDTC treatment. DEDTC did not alter plasma content of pentobarbitone in plasma of male mice, but abolished the decrease in this parameter observed after spironolactone administration. In females which metabolize the barbiturate less rapidly, pentobarbitone plasma levels were higher after DEDTC treatment. In a Letter-to-the-Editor, mechanisms for the action of the dithiocarbamates are suggested.

73-2962. Kopischke, E. D. (Minnesota Dept. Natur. Resources, Madelia, MN). **The effect of 2,4-D and diesel fuel on egg hatchability.** *J. Wildl. Manage. 36(4): 1353-1356; 1972.* (9 references)

Three groups of 57 pheasant (*Phasianus colchicus*) eggs were each sprayed with water, 2,4-D solution, or diesel fuel to assess the effects of these liquids on hatchability. Two groups of 62 bantam chicken (*Gallus domesticus*) eggs were sprayed, one with water and one with 2,4-D solution. Application of 2,4-D in the concentration normally applied for weed control did not adversely affect hatchability of eggs, cause deformities in hatched chicks, or cause death of the chicks. Application of diesel fuel to pheasant eggs reduced hatchability to zero. (Author abstract by permission)

73-2963. Bunch, T. D.; Low, J. B. (Utah Coop. Wildl. Res. Unit, Utah State Univ., Logan, UT 84321). **Effects of dieldrin on chromosomes of semi-domestic mallard ducks.** *J. Wildl. Manage. 37(1): 51-57; 1973.* (16 references)

Juvenile mallard ducks (*Anas platyrhynchos*) from parents receiving long-term doses of dieldrin received 0, 40, 10, or 30 ppm of dieldrin for approximately 60 days. The level of treatment for each juvenile matched that of its parent. At the end of this period femoral bone marrow cultures were examined for chromosomal aberrations. No significant incidence of abnormalities was found within ducks on any of the four levels of treatment. The mitotic index varied little among the juveniles maintained on either the 0, 4, or 10 ppm dieldrin treatment. However, the mitotic index of ducks exposed to 30 ppm dieldrin was significantly reduced more than five times ($P < 0.05$). Lymphocytic cultures established from adult, non-dieldrin receiving ducks were treated with 0.1, 1.0, 10.0, 30.0, and 100.0 ppm dieldrin. The response of cultures treated with 0.1, 1.0, 10.0, and 30 ppm varied little from controls, but lymphocytes treated with 100 ppm dieldrin evidenced a significant increase in incidence of chromosome structural alterations that were two or more times greater than the incidence in controls ($P < 0.05$). The mitotic index was significantly reduced in all cultures treated with dieldrin as compared to controls, with the greatest decreases associated with the 30 and 100 ppm levels. Our results indicate that levels of dieldrin commonly found in free-living waterbirds would probably be too low to elicit chromosome aberrations. (Author abstract by permission)

73-2964. Urushikawa, Y. (Author address not given). **[Biochemical oxidation of aromatic amines formed from herbicides.]** *Kagaku To Kogyo (Chem. Chem. Ind.) 26(7): 429-431; 1973.* (3 references) (Japanese)

Studies on metabolism of 3,4-dichloropropionanilide (propanil) in soil show that the primary metabolite, 3-4-dichloroaniline, is oxidized to tetrachloroazobenzene and aromatic polymers. The formation of aromatic amines, which are oxidized to form azobenzene derivatives, was recognized in the metabolism of carbamate and urea herbicides containing aniline rings. A new problem of environmental pollution by the secondary transformation of such aromatic amines has occurred. Using extracellular peroxidase and aniline oxidase obtained from a fungus, *Geotrichum candidum*, isolated from soil, the oxidation of many kinds of substituted anilines was studied and the relationship between the formation of azobenzene and the structure of aniline derivatives elucidated. Several instances were described to show that the oxidizability of aromatic amines by the oxidase was primarily determined by the electron density of the amino group. The results obtained on the enzyme level appeared to coincide with those obtained in soil.

73-2965. Dziekonski, J.; Poznanski, I. (Inst. for Vet. Hygiene, Bydgoszcz, Poland). **Proba okreslenia toksycznosci Foschloru R-50 dla kurczat jako zanieczyszczenie paszy. [Toxicity of Foschlor R-50 as a feed contaminant to chickens.]** *Med. Wet. 28(10): 621-622; 1972.* (9 references) (Polish)

Groups of five weeks old chickens (500-600 g wt) received 2, 4, 10, 40, and 100 mg/kg Foschlor (trichlorfon) R-50 daily for 10 days. Only birds receiving 10 mg/kg or more showed clinical signs of intoxication such as loss of appetite and diarrhea, the severity of which increased with increasing dose. Pathomorphologic examination of these birds revealed macro- and microscopic changes in heart muscle and small intestines in those receiving 10 mg/kg; in kidneys and sporadically in liver in those receiving 40 mg/kg; and inflammation of pericardium and liver capsule in those receiving 100 mg/kg. Most pronounced were hemorrhages in heart muscle and mucous membrane of the intestines and regressive changes in kidneys. It is concluded that Foschlor R-50 in concentrations up to 4 mg/kg is not toxic to chickens.

73-2966. Mieth, K.; Beier, D. (Inst. Veterinaerwesen Bezirkes Potsdam, Wusterhausen/Dosse, DDR). **Ueber die Alkylphosphatvergiftungen und die Antidotbehandlung. [On the alkyl phosphate intoxications and antidote treatment.]** *Monatsh. Veterinaermed. 28(2): 45-50; 1973.* (39 references) (German)

Studies on the clinical and biochemical action of organophosphorus pesticides on domestic animals and problems of diagnosis and antidote therapy of poisonings are reviewed with reference to efficiency tests on appropriate antidotes. General symptoms of poisoning include respiratory difficulties, hypersalivation, diarrhea, muscular fibrillation, spasms, paresis, and damages of the central nervous system in horses, cattle, sheep, hogs, and dogs. The first symptoms appear 5 to 10 min after inhalation or 30-60 min after ingestion. Obidoxime greatly effected cholinesterase reactivation during studies with PAM, obidoxime, and atropine on cattle, pigs, and sheep. Less satisfactory results were produced by PAM. Obidoxime and atropine sulfate should be administered jointly as soon as possible after the appearance of poisoning symptoms. Since poisonings with alkyl phosphates are accompanied by definite cholinesterase inhibition, determination of the blood cholinesterase activity may be helpful in diagnosis.

73-2967. Kitamura, M.; Sumino, K.; Hayakawa, K.; Shibata, T.; Yano, H. (Sch. Pub. Health, Fac. Med., Kobe Univ., Kobe, Japan.) **[On the ratio of concentration of several harmful substances in the body of fishes bred in an aquarium or model environment.]** *Nippon Eiseigaku Zasshi (Jap. J. Hyg.) 28(1): 118; 1973.* (Japanese)

Fresh-water fishes, *Carassius auratus* and *Cyprinus carpio*, were bred in an aquarium or in a trap set in a

model environment to which several harmful organic and inorganic heavy metals and organochlorine pesticides were added. Fish were killed periodically and analyzed for the added substances to determine the ratio of concentration in fish body to that in water, and experiments in the model environment were conducted to determine the effect of the food-chain on the ratio. The results showed that the ratio of concentration depended on the absorption, degradation, and excretion of the substance. The ratio was the highest with substances easily absorbed and slowly decomposed and excreted. The ratio was lowest with substances absorbed with difficulty and easily degraded and excreted. However, the ratio did not show gradual transitions according to ease of absorption, degradation, and excretion; a distinct dichotomy occurred. The concentration of a substance in the water did not affect the ratio of concentration. An increase in the ratio through the food chain was noticeable with PCBs and methyl mercury. The ratio also showed a saturation with breeding time.

73-2968. Horiguchi, Y. (Dept. Neurol., Saku Gen. Hosp., Usuda, Japan). **Effects of organophosphorus pesticides on mammalian CNS.** *Noha To Kindenzu (Electroencephalogr. Electromyogr.) 1(2): 154; 1972.* (Japanese)

Electroencephalograms from neopallium, paleopallium, and archipallium, along with ECG and blood pressure were recorded in rabbits and monkeys which had been given malathion and fenitrothion perorally or intravenously. In the group given a low (unspecified) dose the EEG showed an arousal pattern, accompanied by slight bradycardia and a decrease in blood pressure. In the group given a larger dose slight bradycardia and a decrease in blood pressure were initially recognized without any change in EEG. After a relatively long latency period, a period of sympathomimetic excitation appeared, with rhythmic hippocampal slow waves and increase in blood pressure, followed by a stage of parasympathomimetic excitation with fast waves in the hippocampus, bradycardia, and lowered blood pressure. Finally, a prolonged stage showing spike and wave complexes beginning in the hippocampus and spreading over the entire brain with increases in heart rate and blood pressure was observed. Paroxysmal waves appeared at lower doses in the monkey than in the rabbit; at lower doses of fenitrothion than malathion; and more readily after oral administration than intravenous administration of both compounds. The last-mentioned observation was attributed to the fact that both compounds become more toxic after oxidation to the oxon in the liver.

73-2969. Joiner, R. L.; Chambers, H. W.; Baetcke, K. P. (Dept. Entomol., Mississippi Agr. Forestry Exp. Sta., Mississippi State Univ., State College, MS 39762). **Comparative inhibition of boll weevil, golden shiner, and white rat cholinesterase by selected photoalteration products of parathion.** *Pestic. Biochem. Physiol. 2(4): 371-376; 1973.* (27 references)

Paraoxon and four other photoalteration products of parathion were much more potent inhibitors of AChE from three different biological sources than the parent compound. I50s for parathion were $> 10^{-4}$ *M* with brain AChE preparations from rat and golden shiner and whole body homogenates of boll weevil. *O*-ethyl *O,O*-bis(*p*-nitrophenyl)phosphate (EBNPP) was the most active inhibitor in the rat and had an activity 11,200 times that of parathion in this animal. The golden shiner was the least sensitive to most of the alteration products while the rat was the most sensitive. Compounds lacking the nitro group had markedly reduced inhibitory activity compared to the parent compounds.

73-2970. Jackson, D. A.; Gardner, D. R. (Dept. Biol., Carleton Univ., Ottawa, Ontario K1S 5B6, Canada). **The effects of some organochlorine pesticide analogs on salmonid brain ATPases.** *Pestic. Biochem. Physiol. 2(4): 377-382; 1973.* (19 references)

DDA, kelthane, DDT, DDE, DDD (TDE), and chloro-DDT markedly inhibited brain ATPase from trout and salmon. Methoxychlor and dieldrin only slightly inhibited trout ATPase. Methoxychlor, but not dieldrin, slightly inhibited salmon ATPase. Inhibition was observed only at concentrations above the limit of solubility of the organochlorines and was abolished when solubilization was achieved with Corexit, suggesting that the precipitate was necessary for inhibition to occur. This finding seems to prove that toxicity of organochlorines is not related to their inhibition of ATPase when coupled with the fact that the efficacy of the compounds to inhibit ATPase activity in vitro does not correspond with in vivo toxicity.

73-2971. Casper, H. H.; Pekas, J. C.; Dinusson, W. E. (Dept. Vet. Sci., N. Dakota State Univ., Fargo, ND 58102). **Gastric absorption of a pesticide (1-naphthyl *N*-methylcarbamate) in the fasted rat.** *Pestic. Biochem. Physiol. 2(4): 391-396; 1973.* (17 references)

Approximately 53 and 82% of the ^{14}C in an intragastric dose of labeled carbaryl administered to anesthetized female rats were absorbed from the stomach after 22 and 67 min, respectively. In a second experiment 69% of the dose was absorbed in 66 min, and 97% of the absorbed material was recovered in the portal blood. TLC and GC analysis indicated that 89% of this material was unchanged carbaryl. Preliminary experiments have shown that gastric ingesta and emptying influence the absorption of this pesticide.

73-2972. Lee, A. H.; Metcalf, R. L. (Dept. Entomol., Univ. Illinois, Urbana, IL 61801). **In vitro inhibition of acetylcholinesterase by *O,O*-dimethyl *S*-aryl phosphorothioates.** *Pestic. Biochem. Physiol. 2(4): 408-417; 1973.* (20 references)

When three AChE enzymes were studied by Main's kinetic treatment, house fly head AChE was the most sensitive to inhibition by seven *O,O*-dimethyl *S*-aryl phosphorothioates, followed by house cricket head, and bovine erythrocyte AChE. No linear relationships were observed between the phosphorylation rate constant and the total binding energy (ΔF) for the inhibition, suggesting that initial binding and phosphorylation rate are not related. Analysis of structure-activity relationships indicated that hydrophobic bonding of the compound on the enzyme surface significantly affected the potency of the inhibition of insect AChE. Inhibition of bovine erythrocyte AChE seemed to be more dependent on the alkaline hydrolysis rates of the compounds.

73-2973. Marshall, R. S.; Wilkinson, C. F. (Dept. Entomol., Cornell Univ., Ithaca, NY 14850). **The interaction of insecticide-synergists with nonenzymatic-model oxidation systems.** *Pestic. Biochem. Physiol. 2(4): 425-436; 1973.* (35 references)

Aldrin epoxidation in a modified Fenton's system (H_2O_2, Fe^{2+}, and bovine serum albumin) was strongly inhibited by representatives of several groups of insecticide synergists including 1,3-benzodioxoles, 1,2,3-benzothiadiazoles, phenyl propynyl ethers, benzylthiocyanates, and SKF 525-A. A detailed study of the 1,3-benzodioxoles showed that the inhibition is competitive and that the materials themselves react with the Fenton system, which produces the OH-radical, and are converted to catechols. A high correlation between the reaction rate and the inhibitory activity of the substituted 1,3-benzodioxoles supports the view that they compete with aldrin for the radical. Of other model oxidation systems investigated, only the titanous chloride/H_2O_2 system, which also is considered to produce OH-radicals, interacted with the insecticide synergists. Part of the inhibitory activity of these synergists may be due to their ability to interact with radicals generated at cytochrome P-450.

73-2974. Gardner, D. R. (Dept. Biol., Carleton Univ., Ottawa, Ontario, Canada, KlS 5B6). **The effect of some DDT and methoxychlor analogs on temperature selection and lethality in brook trout fingerlings.** *Pestic. Biochem. Physiol. 2(4): 437-446; 1973.* (36 references)

Determination of LC50s for a number of DDT-type compounds indicated that only *p,p'*-DDT, *p,p'*-DDD (TDE), and *p,p'*-methoxychlor are toxic to brook trout fingerlings in the 10 to 50 ppb range. Molecular requirements for lethality differed from those found for alteration of temperature selection since all but the DDE-type analogs caused a significant drop in preferred temperature at some concentrations. Maximum effect was generally observed at concentrations between 20 and 30 ppb. The effect of *p,p'*-DDT on temperature selection persisted for nine days while that of *p,p'*-methoxychlor was less marked after two days. The more rapid metabolism of methoxychlor may have been responsible for this difference in persistence of activity, but this factor did not affect lethality of the methoxy-derivative.

73-2975. Plapp, Jr., F. W. (Dept. Entomol., Texas A&M Univ., College Station, TX 77843). **Comparison of insecticide absorption and detoxification in larvae of the bollworm, *Heliothis zea*, and the tobacco budworm, *H. virescens*.** *Pestic. Biochem. Physiol. 2(4): 447-455; 1973.* (31 references)

Larvae of *H. virescens*, a species resistant to organochlorine, carbamate, and organophosphate insecticides, metabolized DDT, carbaryl, aldrin, and malathion more rapidly than larvae of *H. zea*, a species resistant only to organochlorines. A large proportion of the insecticides was converted to polar metabolites, and aldrin was converted to dieldrin, suggesting participation of microsomal oxidases in their breakdown. Larvae of both species contained NADPH-dependent, aldrin-metabolizing enzymes, but the levels were higher in *H. virescens*. A glutathione-dependent enzymatic breakdown of fenitrothion occurred in *H. zea* at a greater rate than in *H. virescens*. The rate of absorption of fenitrothion was approximately 2-fold higher in *H. zea* than in *H. virescens*. Resistance to organophosphates in the latter species may be a consequence of interaction between increased metabolism and decreased absorption.

73-2976. Chiu, Y. C.; Fahmy, A. H.; Fukuto, T. R. (Div. Toxicol. Physiol., Dept. Entomol., Univ. California, Riverside, CA 92502). **Aryl *N*-hydroxy- and *N*-methoxy-*N*-methylcarbamates as potent reversible inhibitors of acetylcholinesterase.** *Pestic. Biochem. Physiol. 3(1): 1-6; 1973.* (11 references)

Ten aryl *N*-hydroxy- and *N*-methoxy-*N*-methylcarbamates had time-dependent and concentration-dependent inhibition of AChE characteristic of reversible inhibitors. The degree of AChE inhibition was not affected when the enzyme was incubated with one of these compounds (*m*-isopropylphenyl *N*-hydroxy-*N*-methylcarbamate) for 12 hr; *m*-isopropylphenyl *N*-methylcarbamate, a typical carbamylating inhibitor, initially decreased and then gradually increased activity due to the regeneration of the enzyme. Results of gel filtration experiments provided additional evidence that the ten esters are reversible AChE inhibitors. Double-reciprocal and Dixon plots for the inhibition of AChE by the esters clearly demonstrated competitive and reversible inhibition. The data indicated that the affinity of these compounds for the enzyme is greater than that reported for strong, irreversible inhibitors. The reversible inhibitors also protected AChE from the effects of irreversible inhibitors. The *N*-methoxy-*N*-methylcarbamate esters were less susceptible to hydrolysis in the presence of alkali than the corresponding methylcarbamate.

73-2977. Hilton, B. D.; Bratkowski, T. A.; Yamada, M.; Narahashi, T.; O'Brien, R. D. (Sect. Neurobiol. Behavior, Cornell Univ., Ithaca, NY 14850). **The effects of DDT analogs upon potassium conductance in synthetic membranes.** *Pestic. Biochem. Physiol. 3(1): 14-19; 1973.* (12 references)

DDT interfered with an ionic conductance mechanism, the K^+ conductance induced by valinomycin in a lecithin-octane bilayer; the response was fairly specific since close analogs behaved in different ways. Analogs with polar ring substituents increased conductance by amounts ranging from 1.8-fold to 3.3-fold. Eight other analogs decreased conductance from 1.6-fold to 2.8-fold and *o,p'*-DDD (TDE) had no effect. These variations were partially correlated with physiological effects on cockroach nerve and crayfish giant axon. Complex formation was not observed between valinomycin and the DDT analogs, and other data has shown that DDT probably acts by effects on matrix fluidity.

73-2978. Hartgrove, R. W.; Webb, R. E. (Dept. Biochem. Nutr., Virginia Polytech. Inst. State Univ., Blacksburg, VA 24061). **The development of benzpyrene hydroxylase activity in endrin susceptible and resistant pine mice.** *Pestic. Biochem. Physiol. 3(1): 61-65; 1973.* (15 references)

The pattern of development of microsomal benzpyrene hydroxylase activity was similar in endrin susceptible and resistant pine mice, but the level of activity and the *Km* values were always lower in the susceptible strain. A sharp and significant increase in the Vmax in both of the strains was observed by the fourth week. The rate continued to increase, but more slowly, until peak levels were attained at six and eight weeks in the resistant and susceptible strain, respectively. At all ages studied the level of total hydroxylase activity was approximately 2-fold greater in resistant microsomes than in susceptible microsomes.

73-2979. Haque, R.; Tinsley, I. J.; McCrady, J. K. (Dept. Agr. Chem., Oregon State Univ., Corvallis, OR 97331). **Binding of organophosphate insecticides to lecithin: a proton magnetic resonance study.** *Pestic. Biochem. Physiol. 3(1): 73-76; 1973.* (8 references)

Chemical shift data from a proton magnetic resonance study of the interaction of four vinyl type organophosphates with a phospholipid lecithin indicates that the interaction probably involves a hydrogen bond formation between the vinyl proton and oxygen atom of the phosphatidyl group of lecithin. The vinyl proton of dichlorvos, Azodrin (monocrotophos), Bidrin, or Shell 4072 showed a low field chemical shift change when lecithin was added, and addition of the organophosphate to a dilute solution of lecithin caused small chemical shift changes in the choline proton peaks. More work is needed in the area of interactions with biological membranes before the importance of these findings can be assessed in relation to toxicological properties of the organophosphates.

73-2980. Still, G. G.; Mansager, E. R. (Agr. Res. Serv., U. S. Dept. Agr., Metab. Radiation Res. Lab., Fargo, ND 58102). **Soybean shoot metabolism of isopropyl-3-chlorocarbanilate: ortho and para aryl hydroxylation.** *Pestic. Biochem. Physiol. 3(1): 87-95; 1973.* (16 references)

A second investigation of the metabolism of chlorpropham in soybean, using isolation techniques which were less severe than those used in the first study, revealed the presence of two polar metabolites in the shoots, 2-hydroxy-chlorpropham and isopropyl-4-hydroxy-3-chlorocarbanilate, in a ratio of approximately 1:1. The only aglycone observed in root tissue was 2-hydroxy-chlorpropham. Previously observed unidentified polar metabolites in shoot tissue were not found by this procedure. Nearly quantitative recoveries were obtained with the method which used the Bligh-Dyer extraction followed by gel permeation and Amberlite XAD-2 chromatography.

73-2981. Kuhr, R. J. (Dept. Entomol., New York State Agr. Exp. Station, Geneva, NY 14456). **The metabolic fate of methomyl in the cabbage looper.** *Pestic. Biochem. Physiol. 3(2): 113-119; 1973.* (10 references)

Three strains of the cabbage looper metabolized radiolabeled methomyl, primarily to water-soluble products. The half-lives of methomyl in susceptible, DDT-resistant, and parathion-resistant strains were 60, 44, and 15 min, respectively. Loss of radioactivity was about 20% after 60 min in each strain and was probably due to expired carbon dioxide and acetonitrile. Studies with acetonitrile and methomyl oxime indicated that metabolism of methomyl to water-soluble products did not occur through acetonitrile formation and that the 20% loss found with methomyl treatment could have occurred without the compound passing through the oxime as intermediate. The water-soluble products of methomyl metabolism were not converted to organo-soluble materials after exposure to acid or enzyme treatment. Activity was maximum in the last larval stage and prepupal forms, especially in the fat body. In vitro metabolism of methomyl by cabbage looper fat body homogenates was dependent on oxygen and NADPH and corresponded to in vivo metabolism except that the water-soluble products were acid labile.

73-2982. Reed, W. D.; Fukuto, T. R. (Dept. Physiol. Chem., Johns Hopkins Univ. School Med., Baltimore, MD 21205). **The reactivation of carbamate-inhibited cholinesterase, kinetic parameters.** *Pestic. Biochem. Physiol. 3(2): 120-130; 1973.* (34 references)

The effects of pH, salt concentrations, and temperature were determined on the rates of spontaneous

regeneration of fly-head and bovine erythrocyte ChE inhibited by methyl- and dimethylcarbamic acid esters. Sephadex gel filtration was used to isolate the carbamylated enzyme. The pH optimum was between 8.6 and 8.9 for the regeneration of bovine AChE inhibited by 3-isopropylphenyl methylcarbamate and 3-isopropyl-4-nitrophenyl dimethylcarbamate. Values were 8.0 to 8.5 for the methyl carbamyl derivative and 8.3 to 8.8 for the dimethylcarbamyl derivative in the case of fly-head enzyme. Regeneration constants obtained show that regeneration is about twice as fast at 26°C for fly-head AChE as for bovine AChE although a larger activation energy was found for housefly enzyme. A secondary isotope effect was suggested by the fact that both enzymes were decarbamylated 6 to 7 times slower in deuterium oxide than in water. No changes were observed in the decarbamylation rate with imidazole, hydroxylamine, and inorganic salts.

73-2983. Thorn, G. D. (Agr. Canada, Res. Inst., London, Ontario, Canada N6A 3KO). **Uptake and metabolism of chloroneb by *Phaseolus vulgaris*.** *Pestic. Biochem. Physiol. 3(2): 137-140; 1973.* (8 references)

Labeled chloroneb, absorbed by the roots of young bean plants, accumulated primarily in the roots and lower stem during a 2-day exposure period. More than half of the fungicide was unaltered while 7% of the extractable radioactivity was in the form of 2,5-dichloro-4-methoxyphenol, and 30% was an unidentified polar metabolite. The uptake, metabolism, and distribution of chloroneb did not appear to be affected by simultaneous exposure to 15 ppm thiram.

73-2984. Metcalf, R. A.; Metcalf, R. L. (Biol. Lab., Harvard Univ., Cambridge, MA). **Selective toxicity of analogs of methyl parathion.** *Pestic. Biochem. Physiol. 3(2): 149-159; 1973.* (28 references)

Mammalian selectivity ratios (MSR) were determined from LD50s in the female mouse and housefly for a number of monosubstituted nitrophenyl dimethyl phosphates and phosphorothioates and ranged from 1.0 to > 880. Methyl parathion was the only phosphorothioate appreciably toxic to the mouse; it was apparently less toxic to females than previously reported for males. Highest selectivity ratios were exhibited by compounds in the order 2–Cl > 3–CF_3 > 3–CH_3. Kinetic data obtained with AChE from bovine erythrocytes and houseflies indicated that differences in the configuration and reactivity of the active sites of the AChE may partially explain the selectivity of the chemicals, but differential degradation must also be involved.

73-2985. Tillman, R.W.; Siegel, M. R.; Long, J. W. (Dept. Plant Pathol., Univ. Kentucky, Lexington, KY 40506). **Mechanism of action and fate of the fungicide chlorothalonil (2,4,5,6-tetrachloroisophthalonitrile) in biological systems. I. Reactions with cells and subcellular components of *Saccharomyces pastorianus*.** *Pestic. Biochem. Physiol. 3(2): 160-167; 1973.* (20 references)

GSH (reduced glutathione) concentration decreased rapidly in ^{35}S-labeled yeast cells incubated with chlorothalonil from 0 to 8 hr. About two thirds of the ^{35}S in the ethanol soluble fraction of the cells was in GSH and was converted to halogen substituted unidentified chlorothalonil-glutathione derivatives. When cells were treated with ^{14}C-labeled chlorothalonil, these derivatives were also found. About 24% of the ^{14}C label was associated with high molecular weight components in the cell. The association was unstable in the presence of precipitating agents such as ammonium sulfate. Of seven enzymes tested, only those requiring NAD thiol were inhibited by chlorothalonil. Cell viability began to decrease after three hours of incubation with the fungicide when there was no GSH present and the NAD thiol-dependent glycolytic and respiratory enzymes were inhibited.

73-2986. Ku, T. Y.; Dahm, P. A. (Dept. Zool. Entomol., Iowa State Univ., Ames, IA 50010). **Effect of liver enzyme induction on paraoxon metabolism in the rat.** *Pestic. Biochem. Physiol. 3(2): 175-188; 1973.* (41 references)

The major urinary metabolites of paraoxon in rats were diethylphosphoric acid (DEPA) and desethyl paraoxon. Rats pretreated with enzyme inducers excreted more desethyl paraoxon and less DEPA and expired more $^{14}CO_2$ after administration of [1-^{14}C] ethyl paraoxon than control rats. Recoveries of radioactivity 72 hr after administration were: urine 79, 75, 67, 64, and 53%; $^{14}CO_2$ 7, 9, 14, 25, and 33%; and feces 7, 9, 8, 10, and 6% for control, endrin, dieldrin, DDT, and phenobarbital pretreatments, respectively. The inducers affected microsomal paraoxon-degrading enzymes rather than enzymes in the soluble fraction. DEPA was the principal paraoxon metabolite produced in vitro by microsomal enzymes from control rats, and an increase in the production of desethyl paraoxon was observed in microsomal fractions from phenobarbital-pretreated rats. Dealkylation was observed to be a more active process in male rats than in female rats while DEPA formation was highest in females.

73-2987. Hilton, B. D.; O'Brien, R. D. (Sect. Neurobiol. Behavior, Cornell Univ., Ithaca, NY 14850). **The effects of DDT and its analogs upon lecithin and other monolayers.** *Pestic. Biochem. Physiol. 3(2): 206-213; 1973.* (14 references)

DDT, 11 of its analogs, dieldrin, and lindane shifted pressure area curves for a lecithin monolayer in a direction and to an amount that suggested 1:1 complex formation with lecithin. DDT had no effect on pressure-area plots obtained with cholesterol films. Films of total

phospholipids from *Torpedo* electroplax were affected by DDT and DDMU in the same way as lecithin films. Since physiologically active and inactive analogs of DDT did not differ in their effects on monolayers, the effects of DDT on nerves and bilayers may not be due to an interaction with phospholipids.

73-2988. Wiese, M. V.; Vargas, Jr., J. M. (Dept. Botany Plant Pathol., Michigan State Univ., East Lansing, MI 48823). **Interconversion of chloroneb and 2,5-dichloro-4-methoxyphenol by soil microorganisms.** *Pestic. Biochem. Physiol. 3(2): 214-222; 1973.* (16 references)

Chloroneb was degraded to DCMP (2,5-dichloro-4-methoxyphenol) in rapidly growing cultures of 14 out of 23 soil microorganisms tested. *Fusarium solani* was the most active organism in this regard, converting about 60% of the material to DCMP in five days. Sensitivity to chloroneb was not a primary factor in its conversion by various microorganisms. Unexpectedly, DCMP was converted to chloroneb by 11 of the 23 microorganisms, the most active of which were *Trichoderma viride, Mucor ramannianus, Aspergillus fumigatus, Cephalosporium gregatum,* and *F. solani*. DCQH (2,5-dichlorohydroquinone) was not detectable in any culture grown in medium amended with chloroneb, and only four organisms produced detectable quantities of this material from DCMP. The results explain the low rate of degradation observed for chloroneb in soil in comparison to its rate of degradation in plants and individual fungi.

73-2989. Flick, D. F.; Firestone, D.; Higginbotham, G. R. (Bureau of Drugs and Foods, Food and Drug Admin., Washington, DC 20204). **Studies of the chick edema disease. 9. Response of chicks fed or singly administered synthetic edema-producing compounds.** *Poultry Sci. 51(6): 2026-2034; 1972.* (18 references)

Feeding and injection studies have been performed with synthetic compounds which produce edema and pathological changes in S.C. White Leghorn chicks. Polychlorinated derivatives of dibenzo-*p*-dioxin were prepared either by chlorination of dibenzo-*p*-dioxin or by pyrolysis of 2,3,4,6-tetrachlorophenol and pentachlorophenol. The compounds prepared were administered to chicks by either oral feedings, oral intubation, or intra-abdominal injection. Results of the feeding studies indicated that the hexachloro derivatives of dibenzo-*p*-dioxin most readily elicited the edema aspect of the chick edema disease but had low lethality, whereas the derivatives containing 3 and 4 chlorine atoms per molecule also caused edema but were the most lethal of the compounds tested. Hepta- and octachloro-dioxins, although capable of producing evidence of disease, were less toxic than the other polychlorinated derivatives. The pyrolytic product of 2,3,4,6-tetrachlorophenol, a mixture of predominantly hexa- and heptachloro-dibenzo-*p*-dioxins, was toxic when administered in single doses by way of oral intubation or by intra-abdominal injection. (Author abstract by permission)

73-2990. Khaitov, R. K.; Baymuradov, T. B.; Kadyrov, U. S. (Author address not given). **Lechebnaya effektivnost' atropina i dipiroksima. [Therapeutic efficiency of atropine and dipyroxime.]** *Veterinariya (Moscow) 11: 86-87; 1972.* (Russian)

The effectiveness of atropine, dipyroxime, and their combinations as therapy for acute poisoning with butiphos (DEF) was studied in rabbits and sheep to which lethal doses (250 and 150 mg/kg, respectively) of the pesticide were administered. Rabbits were administered 5 mg/kg doses of atropine, 15 mg/kg doses of dipyroxime, or 3 mg of atropine with 10 mg of dipyroxime per kg of body weight i.m. as soon as clinical symptoms of poisoning (tachycardia, tachypnea, miosis, sialorrhea, and tremor of the skeletal muscles) developed. Sheep were administered 15 mg/kg of dipyroxime or 2 mg/kg atropine plus 10 mg/kg dipyroxime. A combination of atropine with dipyroxime proved to be most effective. Recovery was complete in 10 days in rabbits and in 15 days in sheep. Antidotes had to be given 5 or 6 times for recovery in all cases. Erythrocyte and leucocyte counts and blood sugar level increased during the course of recovery. Plethora of the parenchymatous organs and of the submucous layers of the internal organs, focal hemorrhages, and hyperemia of the lungs were seen at autopsy.

73-2991. Zhavoronkov, N. I.; Polyakova, V. N.; Verkhovskiy, A. P. (All-Union Inst. Exp. Vet., Moscow, USSR). **Metod opredeleniya i dinamika raspredeleniya triallata v organakh zhivotnykh. [Method of determination and dynamics of triallate distribution in animal organs.]** *Veterinariya (Moscow) 11: 89-90; 1972.* (Russian)

A colorimetric method for the determination of triallate residues in organs of animals and the dynamics of triallate residues in the organs of rabbits, chickens, and sheep are described. Triallate is extracted from organ samples by means of *n*-hexane and the purified extract treated with pyridine in alkaline medium for colorimetric determination. The sensitivity of the method is 5 μg of triallate in the sample or 0.5 mg/kg, the accuracy being 90%. During the residue dynamics study rabbits were fed single 500 mg/kg doses of triallate. Triallate was absorbed from the gastrointestinal tract in 30 min, and highest residue levels accumulated in different organs 20-72 hr after poisoning. Urine contained small amounts of triallate, and the gastrointestinal tract and lungs were chiefly responsible for elimination. Residue levels were highest in the liver, spleen, kidney, and lungs, and small amounts were detected in the brain. Elimination was completed in 7 to 10 days. Meat, organs, and eggs of chickens fed 1/240 of LD50 for 100 days did not contain triallate residues. Traces of triallate were detected in the meat of sheep six days after poisoning with 300 mg of triallate per kg.

73-2992. Thompson, Jr., L. (Dept. of Agron., Univ. of Kentucky, Lexington, KY 40506). **Metabolism of chloro**

s-triazine herbicides by *Panicum* and *Setaria*. *Weed Sci. 20(6): 584-587; 1972.* (19 references)

Six *Setaria* species and varieties and three *Panicum* species were allowed to absorb ^{14}C-labeled atrazine, propazine, and/or simazine. The grasses metabolized the herbicides to water-soluble derivatives. Peptide conjugates were the only major metabolites formed by each species or variety; however, hydroxyderivatives of the herbicides were detected. The order of ability of the *Setaria* and *Panicum* species and varieties to metabolize atrazine and/or propazine was similar to the order of their tolerance to atrazine and/or propazine. Several *Setaria* and *Panicum* species and varieties formed peptide conjugates of atrazine and/or propazine, to which they are resistant, more rapidly than they formed peptide conjugates of simazine, to which they are susceptible. (Author abstract by permission)

73-2993. Badescu, C.; Hrisanidi, S.; Mihai, M. D.; Samoilescu, M. (Dept. Med. Vet., Bucharest, Rumania). **L'action du neguvon sur les acides amines libres, sur quelques tissus animaux et cultures cellulaires. [The effect of neguvon on free amino acids, some animal tissues, and cell cultures.]** *Wiad. Parazytol. 18(4-5-6): 675-686; 1972.* (1 reference) (French)

Single, oral doses of neguvon (trichlorfon) at 10 to 100 mg/kg were administered to guinea pigs, horses, dogs, rabbits, and mice to determine effects on blood and liver free amino acids, tissues, and kidney cell cultures. Histological investigations revealed visible lesions primarily in liver (fatty degeneration, hyperemia) and kidney (congestion, granular dystrophy). The sensitivity of the species to trichlorfon decreased in the order dogs > guinea pig > rat > mice > rabbit > horse. Lesions provoked by trichlorfon doses of 10 to 100 mg/kg were slight and showed a tendency of rapid remission within 72 hr. Free amino acid levels in liver and blood increased, in most cases considerably. Elevated fat levels were observed in cell cultures in 24 to 48 hr. It is concluded that trichlorfon is suitable for parasite control in animals at recommended doses of 40 to 60 ppm in the diet.

73-2994. Badescu, C.; Ionescu, A.; Caprarin, A.; Hrisanidi, S.; Vasilescu, V. (Dept. Vet. Med., Bucharest, Rumania). **Les changements morphologiques et biochimiques du sang des oiseaux a la suite du traitement avec emulpan et neguvon. [Morphological and biochemical changes in avian blood as a result of treatment with neguvon and emulpan.]** *Wiad. Parazytol. 18(4-5-6): 687-695; 1972.* (French)

Morphological and biochemical changes in the blood of 3-month-old Plymouth chickens were studied after ingestion of neguvon (trichlorfon) and Emulpan. One group was treated with 50 mg/kg oral doses of trichlorfon, another was dusted with trichlorfon, and two other groups were sprayed with solutions of trichlorfon and Emulpan, respectively. Blood samples were taken 2, 6, 12, and 24 hr and 2, 3, 8, 15, and 22 days after treatment. Emulpan caused less pronounced and more gradual changes in the blood picture, appearing after two days; the effects of trichlorfon appeared in a few hours. The blood changes included pronounced decreases in the erythrocyte count and hemoglobin and hematocrit levels, reduction in the leukocyte count with heterophilopenia or neutropenia, distortions of both the shape and dimensions of erythrocytes and leukocytes, development of cytoplasmic vacuoles, a hypoproteinemia-type dysproteinemia, reduced albumin and increased globulin levels, and hyperlipemia. The biochemical changes observed are indicative of intensified protein catabolism and of lipid anabolism.

73-2995. Buruiana, L. M.; Lozinschi, A.; Badescu, C. (Fac. Vet. Med., Lab. Biochem., Bucharest, Rumania). **The persistence in the blood of hens of organophosphoric compounds, applied by different ways.** *Wiad. Parazytol. 18(4-5-6): 697-702; 1972.* (5 references)

The concentration and persistence of dipterex (trichlorfon), reflected in the degree of inhibition of blood AChE, varied with the administration route to the hens. After oral administration of a dose of 50 mg/kg the maximum inhibition of AChE, obtained at 2 hr, was 42%, and levels returned to normal within 72 hr. Ten hens treated with a mixture of 100 g dipterex and 500 g talc as a powder exhibited a maximum 55% AChE inhibition in 2 hr; levels did not return to normal until 21 days later. Spray treatment with an equivalent dose of dipterex (100g/lot) resulted in a similar maximum response, and the insecticide persisted for 21 days. Hens which have been treated with dipterex should not be sent for sale until three days after oral treatment or 21 days after spraying or dusting.

See also 73-2786 73-2807 73-2832 73-2861 73-2867

73-2996. Hartmann, C. H. (Varian, Aerograph Operations, Walnut Creek CA 94598). **Evaluation of tritiated scandium for the electron capture detector.** *Anal. Chem. 45(4): 733-739; 1973.* (9 references)

A new electron capture detector which uses a tritiated scandium source minimized the contamination effect characteristic of titanium sources and increased the sensitivity to a 7-pesticide standard in field tests carried out during produce analysis. Changes in temperature did not affect the sensitivity of the new detector to lindane, aldrin, heptachlor epoxide, and *p,p'*-DDE. Noticeable changes in sensitivity were observed with changes in temperatures for heptachlor, *p,p'*-DDD, and *p,p'*-DDT. After 31 days of continuous operation a stable baseline was maintained, and a parathion overtolerance was detected. The maximum operating temperature of the source was set at 325 from an ^{3}H emanation study.

73-2997. Onuska, F. I.; Boos, W. R. (UniRoyal (Canada) Ltd., Res. Lab., Guelph, Ontario, Canada). **Gas chromatographic and mass spectrometric studies of *S*-alkyl derivatives of *N,N*-dialkyl dithiocarbamates.** *Anal. Chem. 45(6): 967-971; 1973.* (19 references)

GC-MS has been useful in the separation and identification of *S*-*n*-propyl-, *S*-ethyl-, and *S*-methyl *N,N*-dialkyl dithiocarbamates in wastewater. GC was carried out using a column of Apiezon L on Varaport and a flame ionization detector. An instrument with a slit separator was used for GC-MS; the electron energy in the electron impact detector (EID) was 20 eV and 80 eV in the mass spectrometric detector (MSD). The derivatives were easily separated by GC, and MS data obtained from eluted peaks gave fragmentation patterns generally consistent with bond rupture directed by the presence of bivalent sulfur. There was a predictable array of intense peaks at high values and the molecular ion (M+). The size of the latter depended on the nature of the *N* substituents. *S*-*n*-propyl esters were tested at different temperatures and various electron energies and found to be stable to electron impact and also up to 250°C to thermal decomposition.

73-2998. Crochet, K. L.; Montalvo, Jr., J. G. (Dept. of Anal. Chem., Gulf South Res. Inst., P. O. Box 26500, New Orleans, LA 70186). **Enzyme electrode system for assay of serum cholinesterase.** *Anal. Chim. Acta 66(2): 259-269; 1973.* (8 references)

An enzyme-sensing electrode system for serum cholinesterase was prepared by coupling a pH-sensing electrode to a thin polymer membrane with a low-molecular-weight cutoff. The electrode system utilized two thin-layered solutions to form a micro electrochemical cell. One layer contained the serum; the other contained acetylcholine substrate which had been stabilized to annul the nonenzymatic decay of the substrate by using a high-molecular-weight buffer. An assay can be performed in 1.5-4.5 min. The precision and accuracy of the technique is comparable with those obtained by spectrophotometric techniques. (Author abstract by permission)

73-2999. Spacu, P.; Dumitrescu, H. (Catr. Chim. Anorgan., Fac. Chem., Univ. Bucharest, Rumania). **Determinarea volumetrica a insecticidului sistemic Rogor (dimetoat). [Volumetric determination of the systemic insecticide, Rogor (dimethoate).]** *An. Univ. Bucuresti Chim. 20(2): 45-49; 1971.* (7 references) (Rumanian)

A new method is described for indirect or direct volumetric determination of dimethoate with sodium chlorite. For indirect titration a known amount of 0.05 or 0.1 *N* sodium chlorite solution is added to the insecticide; HCl is then added to bring the concentration to 2-3 *N*. The excess reagent is determined iodometrically after 10 sec. A minimum of 60% excess oxidizing agent must be present. Other acids do not give suitable reactions. For direct determination, the same reagent is used with a M. V. 11 potentiometer and platinum and calomel electrodes. The optimal acid concentration range is 2-6 *N* HCl. The determination is not satisfactory in the presence of other inorganic or organic acids or of the preoxidants KI and KBr. The reaction rate and the titration speed can be improved by adding a small quantity of Cu^{2+} ions as catalyst. The method is reproducible, rapid, and very simple. (From author abstract)

73-3000. Manusadzhyan, V. G. (Moscow N. I. Pirogov State Inst. Med., Moscow, USSR). **Mass-spektrometricheskiy analiz fosfamida. [Mass-spectrometric analysis of dimethoate.]** *Arm. Khim. Zh. 26(1): 70-71; 1973.* (2 references) (Russian)

The mass-spectrometric analysis of dimethoate in tissues and organs and at 100°C source temperature according to the method described by Sergeyev-Manusadzhyan-Seyfulla-Mul'tanovskiy is described. The 225, 183, and 141 m/e peaks were characteristic of the mass spectrum of dimethoate in the high-molecular range. The peak groups below 100 m/e may equally pertain to phosphorus-containing fragments and pyrimidine ion fragment; the molecular ion was highly stabilized at 225 m/e. Dimethoate can be identified in tissues using the analytical lines in the high-molecular range and the 97, 95, 85, 83, 81, 71, and 70 m/e peaks.

73-3001. Schmid, K.; Rastetter, A.; Burkart, F. (Landesanst. Tabakbau Tabakforsch., Forchheim bei Karlsruhe, Germany). **Die Forchheimer Methode zur Bestimmung von Dithiocarbamate-Rueckstaenden bei Tabak. [The Forchheim method for determination of dithiocarbamate residues in tobacco].** *Beitr. Tabakforsch. 6(5): 223-226; 1972.* (5 references) (German)

The establishment of pesticide residue tolerances for tobacco has required a method for determining the

widely used dithiocarbamates since previously published methods were not suitable for tobacco. In the method developed at Forchheim the tobacco leaves are carefully dried at 25-30°C, then gently ground. Green tobacco leaves must be ground in a 1:1 mixture with sodium ascorbate solution as an antioxidant. A 5-g tobacco sample is placed in a 250 ml distillation flask with 50 ml of 5% sodium ascorbate solution. The flask is connected to a special four-trap apparatus, and the air displaced with nitrogen; 50 ml of 70% formic acid is then run in through a dropping funnel. The first trap is filled with 10 ml of 5% cadmium acetate in 5% acetic acid, and each of the next three traps is filled with 10 ml 1 *N* methanolic (95%) KOH. The flask is gently heated to boiling, and the carbon disulfide formed is driven out with nitrogen. A hydrolysis time of one hour is allowed from the beginning of boiling. The contents of the last three traps are rinsed into a 100 ml volumetric flask which is filled up to the mark with water and the absorbance of this solution read at 275 nm, 302 nm, and 330 nm. The solution is stable for several hours. The recovery rate was better than 90%, even for green tobacco, and reproducibility was good.

73-3002. Riva, M.; Carisano, A.; Daghetta, A. (Lab. Rich. Star, Agrate Brianza (Milan), Italy). **Rivelatore a due fiamme ionizzanti in parallelo, modificato con cloruro di potassio, per la determinazione gascromatografica selettiva di pesticidi fosforati ed azotati. [Parallel dual-flame ionization detector, modified with potassium chloride, for the selective gas chromatographic determination of phosphorus- and nitrogen-containing pesticides.]** *Boll. Lab. Chim. Prov. 22(4): 705-716; 1971.* (10 references) (Italian)

Gas chromatography offers significant advantages in precision, speed, and simplicity for the analysis of pesticide residues in foods. Alkali flame ionization detectors are customarily used in the analysis of pesticides containing phosphorus and nitrogen atoms. The reduction in specificity of response which may occur when pesticides are to be analyzed in the presence of large amounts of organic co-extractives can be combatted by operational coupling of two flames. The detector examined coupled a conventional flame ionization detector with a potassium chloride thermoionization detector, and permitted satisfactory determination of 0.4 ppm parathion in 1 μl. of unpurified fish extract, and detection of 0.2 ppb of malathion and parathion in an unpurified apple extract after 100-fold concentration. The high selectivity of this detector is attributable to electrical or visual elimination of carbon skeleton peaks.

73-3003. Zawadzka, H.; Adamczewska, M.; Elbanowska, H. (Institute of Communal Management, Poznan, Poland). **Oznaczanie symazyny, atrazyny i prometryny w wodach naturalnych i sciekach komunalnych metoda chromatografii cienkowarstwowej. [Determination of simazine, atrazine and prometryne in natural water and sewage by thin layer chromatography.]** *Chem. Anal. (Warsaw) 18(2): 327-331; 1973.* (6 references) (Polish)

The best conditions for the detection of small amounts of simazine, atrazine, and prometryne herbicides were determined in a series of experiments. Abbott's method for the determination of triazine herbicides did not lend itself to the detection of these substances in natural waters and municipal sewage because of interfering impurities. The method was modified by introducing an intermediate step of extract purification consisting of column chromatography with basic Al_2O_3 as the stationary phase and elution with ethyl ether. The thin layer chromatographic results were improved by the addition of fluorescein to the silica gel used for coating of plates, UV irradation of plates, and reading under a quartz lamp with a 254 nm filter. Detection of 2.5 ppb of atrazine and simazine and of 0.5 ppb prometryne was possible.

73-3004. Nagasawa, K.; Yamada, T.; Ogamo, A. (School Pharm. Sci., Kitasato Univ., Shirokane 5-9-1, Minato, Tokyo, Japan). **Reductive cleavage of sulfur containing organophosphorus compounds with Raney nickel.** *Chem. Pharm. Bull. 19(11): 2373-2379; 1971.* (17 references)

Cidial (phenthoate), malathion, and dimethoate, having the common structure $(CH_3O)_2P(S)SR$, were treated with Raney nickel for one hr at 83 in anhydrous ethanol. TLC and GC analysis of the products indicated that the pesticides were reductively cleaved to a characteristic, non-phosphorus-containing product (ethyl phenylacetate, diethyl succinate, or *N*-methylacetamide, respectively) and a main phosphorus-containing product. The latter product, not identified, did not contain sulfur and had both the CH_3OP- and P=O groups in its structure. The method represents a new tool for characterizing these types of pesticides, but recoveries were not high enough to make it useful for quantitative determinations.

73-3005. Sherma, J. (Dept. Chem., Lafayette College, Easton, PA). **Chromatographic analysis of pesticide residues.** *Crit. Rev. Anal. Chem. 3(3): 299-354; 1973.* (487 references)

Methods of gas, thin-layer, paper, and liquid-column chromatographic analysis of mixed and individual pesticide residues in various types of samples are reviewed. GC is the most commonly used technique, both for qualitative and quantitative work. Paper and thin-layer chromatography are primarily used for confirmation of results obtained by GC, but also are useful for cleanup of sample extracts prior to GC and for semiquantitative analysis when GC is not available or not applicable. Liquid chromatography, previously used mostly for cleanup, has recently been improved by high speed methods and can be used for resolution and deter-

mination on nonvolatile or unstable compounds. Each technique has its limitations and requires that certain precautions be taken to assure reliable results.

73-3006. Ohta, T.; Ishikura, S. (Fac. Pharm. Sci., Sci. Univ., Tokyo, Japan). **[Studies on the selectivity in detecting organophosphorus and carbamate pesticides by thin-layer chromatographic enzyme inhibition technique.]** *Eisei Kagaku (J. Hyg. Chem.) 19(4): 219-226; 1973.* (19 references) (Japanese)

Enzymatic detection of organophosphate and carbamate pesticides by thin-layer chromatography was investigated. Pesticides were developed on Avicel thin-layer plates with reverse-phase partition systems for organophosphates and normal-phase for carbamates. After development the plates were exposed to bromine vapor in some cases. Detection comprised spraying with enzyme solution, incubating for 20 min at room temperature, then spraying with substrate solution. Of the substrate-esterase combinations tested, rabbit liver-indoxyl acetate (no Br) was most selective and sensitive to phosphates and *N*-methylcarbamates; Br-rabbit liver-phenyl acetate to all organophosphates; and no Br-rabbit serum-indoxyl acetate to *N*-methylcarbamates and all organophosphorus pesticides. Selectivity for *N*-phenyl and *N*-naphthylcarbamates was not observed. Carbamates were not detected using chymotrypsin after bromination, and selective detection was not possible because of low sensitivity for organophosphorus pesticides. The inhibitory activity of phosphorothioates and phosphorodithoates was markedly increased by bromine treatment, so that these can be distinguished from phosphate and carbamate pesticides, which are not affected by bromine treatment. (From author abstract)

73-3007. Vasyagina, R. D.; Chmil', V. D. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR). **Opredeleniye ostatochnykh kolichestv butilovogo efira 2,4-dikhlorfenoksiuksusnoy kisloty v ob"ektakh vneshney sredy metodom gazo-zhidkostnoy khromatografii. [Determination of 2,4-dichlorophenoxyacetic acid butyl ester residues in the environment by gas-liquid chromatography.]** *Gig. Sanit. 38(5): 69-72; 1973.* (4 references) (Russian)

A gas-liquid chromatographic method is described for the quantitative determination of 2,4-DB in air and water. Air is passed through a series of four *n*-hexane-filled absorbers at a rate of 1 l./min for 25-50 min. The sample obtained is concentrated in a rotary evaporator, dried with anhydrous sodium sulfate, and combined with 50 μg of 2,4,5-T methyl ester in *n*-hexane for chromatographic determination on chromosorb W. Conditions include nitrogen as carrier gas, a column temperature of 186°C, and a differential flame ionization detector. The sensitivity of the method is 0.3 μg/l. Calibration curves are set up for both 2,4-DB and 2,4,5-T methyl ester. Water samples are mixed with 2,4,5-T methyl ester and hydrochloric acid and extracted with diethyl ether. The extract is treated with sodium hydroxide solution and anhydrous sodium sulfate prior to chromatographic determination with a sensitivity of 10 μg/l. As long as the internal standard is added to the sample prior to extraction, recovery studies are not necessary.

73-3008. Vayntraub, F. P.; Nesterova, I. P. (All-Union Sci. Res. Inst. Biol. Plant Protect., Kishinev, USSR). **Opredeleniye 2-metoksi-3,6 dikhlorbenzoynoy kisloty (Banvel-D) v yablokakh metodom tonkosloynoy khromatografii. [Determination of 2-methoxy-3,6-dichlorobenzoic acid (Banvel-D) in apples by means of thin-layer chromatography.]** *Gig. Sanit. 38(5): 79-81; 1973.* (2 references) (Russian)

A method is described for the extraction and thin-layer chromatographic determination of 2-methoxy-3,6-dichlorobenzoic acid (Banvel-D, dicamba) residues in apples. The residue is extracted from homogenized apples with water. The solution is filtered, combined with sodium hydroxide, and treated with thioether to remove wax and pigments. The dimethylamine salt is subsequently converted to the free acid. Banvel-D is finally extracted with petroleum ether, the extract distilled, and the dry residue dissolved in thioether prior to application to a silica layer. Ethyl acetate with cyclohexane; benzene with chloroform, dioxane, and formic acid; and thioether with petroleum ether and formic acid are used as solvent systems. Spots are visualized with ammoniacal silver nitrate. Banvel-D appears in the form of brown spots under UV light. The sensitivity of the thin-layer chromatographic method is 0.4 mg/kg.

73-3009. Novikova, K. F.; Mel'tser, F. R.; Musamukhamedov, S. R. (All-Union Sci. Res. Inst. Chem. Means Plant Protect., Moscow, USSR). **Opredeleniye isofosa-2 v vode s ispol'zovaniyem khromatografii v tonkom sloye. [The determination of isofos-2 in water by thin-layer chromatography.]** *Gig. Sanit. 38(7): 75-76; 1973.* (Russian)

A thin-layer chromatographic method for the determination of isofos-2 (*O*-2,4-dichlorophenyl-*N*-isopropylamidochloromethyl-thiophosphate) in water is described. The herbicide is extracted from the water with chloroform, after which the free phenols are removed through washing with sodium hydroxide. Chromatographic analysis is done on a silica layer, using hexane-acetone (6:1) or hexane-chloroform (1:1) as solvent systems. The isophos-2 spots are developed with aminoantipyrine reagent. The sensitivity of the thin-layer chromatographic method is 1 μg per sample or 0.01 mg/l.

73-3010. Cazaceanu, E. (Inst. Hyg. and Pub. Health, Bucharest, Rumania). **Metode de determinare in apa a insecticidului alfa-naftil-*N*-metil carbamat. [Methods for the determination of the alpha-naphthyl-*N*-methyl carbamate insecticide in water.]** *Igiena 20(12): 737-740; 1971.* (5 references) (Rumanian)

One colorimetric and one chromatographic procedure for the determination of α-naphthyl-*N*-methyl carbamate (carbaryl) in water samples are given. The colorimetric method is based on measurement of the color of the coupling product resulting from reaction of the α-naphthol (generated by potassium hydroxide hydrolysis of the insecticide) with diazotized sulfanilic acid. Carbaryl is extracted from acidified water samples with heptane-ether mixtures. The purified extract is evaporated to dryness at 60°C, dissolved in methyl alcohol, brought to a certain volume with bidistilled water, and an aliquot hydrolyzed with 5% potassium hydroxide. The color is measured immediately after addition of diazotized sulfanilic acid. The method is sensitive enough to detect 0.001 mg carbaryl/sample. Paper chromatography is also used; heptane-ether extract residues are dissolved in small amounts of methyl acetate and placed on sodium borate-buffered strips, with chloroform/ethyl ether (9/1) mixture used as the mobile phase. The chromatogram is air-dried after 1.5 hr, sprayed with a 0.1% dibromoquinone chloroimide solution, dried, and sprayed again with a 5% NaOH solution. α-Naphthol appears as a dark blue-purplish spot at approximately 1.0 to 1.5 cm from the solvent front. The sensitivity of the reaction allows detection of 0.1 μg α-naphthol per sample.

73-3011. Canuti, A.; Bolzoni, G.; Coppiardi, G.; Marchi, A. (Lab. Chim. Prov., Cremona, Italy). **Ricerca del parathion, metilparathion, dieldrin, DDT, eptacloro, lindano e clordano nei prodotti ortofrutticoli. [Analysis of parathion, methyl parathion, dieldrin, DDT, heptachlor, lindane, and chlordane in fruit and vegetable products.]** *Ind. Aliment. (Pinerolo, Italy) 11(10): 92-96; 1972.* (8 references) (Italian)

Colorimetry, thin layer chromatography, and gas chromatography were discussed concerning detection of parathion, methyl parathion, dieldrin, DDT, heptachlor, lindane, and chlordane. Results using these methods were fairly similar although TLC could be used only for qualitative analysis. An enzymatic detection method based on the cholinesterase inhibiting ability of organophosphorus pesticides and using selected enzyme sources (blood serum) was introduced. Analytical procedures were followed as described in the *Italian Official Gazette* No. 28, Feb. 1, 1968. Benzene and isopropyl alcohol are used for extraction. In lettuce the colorimetric method revealed parathion plus methyl parathion contents of 0.034 ppm; the gas chromatographic method registered 0.042 ppm.

73-3012. Canuti, A.; Coppiardi, G.; Bolzoni, G.; Marchi, A. (Lab. Chim. Prov., Cremona, Italy). **Ricerca e determinazione del parathion e del metilparathion nel latte. [Detection and determination of parathion and methyl parathion in milk.]** *Ind. Aliment. (Pinerolo, Italy) 11(11): 83-86; 1972.* (4 references) (Italian)

Quantitative analysis of parathion and methyl parathion in milk by the colorimetric method based on the Averell and Norris reaction as modified by Alessandrini was evaluated. Milk fat, containing the lipid-soluble pesticide, is extracted with hexane-acetone. The nitro group of parathion is reduced to an amino-group with zinc powder and hydrochloric acid. Parathion and methyl parathion are determined spectrophotometrically at 555 nm using the reddish color resulting from coupling of the diazo derivative of the active substance with *N*-(naphthyl)-ethylene-diamine hydrochloride. The method is satisfactory for qualitative analysis. Used as a quantitative method several drawbacks were noted. The marked turbidity of the solution makes the spectrophotometric reading and thus the results unreliable. Another drawback which can also interfere with qualitative determination is the fact that the colorimetric reaction is given by any organic compound containing a nitro-group attached to the aromatic ring. The method does not lend itself to distinguishing between parathion and methyl parathion; its best application is for screening samples submitted for analysis.

73-3013. Ivey, M. C.; Oehler, D. D.; Claborn, H. V. (U. S. Livestock Insects Lab., Agr. Res. Serv., U. S. Dept. Agr., Kerrville, TX 78028). **Gas-liquid chromatographic determination of chlorfenvinphos in milk, eggs, and body tissues of cattle and chickens.** *J. Agr. Food Chem. 21(5): 822-824; 1973.* (6 references)

A gas chromatograph equipped with a flame photometric detector provided a highly sensitive method of determining residues of chlorfenvinphos in milk, eggs, and body tissues of cattle and chickens. With extraction and cleanup 0.002 ppm of the insecticide could be detected in milk and 0.001 ppm in body tissues and eggs. Recoveries of 83-100% were obtained from the fat, muscle, kidney, liver, and heart of cattle and from the fat, muscle, liver, skin, and manure of chickens. Recoveries of 93% were obtained from milk, and 81% was obtained from eggs. (Author abstract reprinted by permission of the American Chemical Society)

73-3014. Pack, D. E.; Lee, H.; Bouco, L.; Sumida, S.; Hisada, Y.; Miyamoto, J. (Chevron Chem. Co., Richmond, CA 94804). **Gas-liquid chromatographic method for the analysis of dichlozoline residues in grapes and grape products.** *J. Ass. Offic. Anal. Chem. 56(1): 53-55; 1973.* (2 references)

Dichlozoline residues are extracted from field-treated grapes and the must, juice, or wine derived from them with hexane and analyzed by gas-liquid chromato-

graphy, using electron capture detection. For residues below 0.5 ppm, a silica gel G column is used for cleanup. Recoveries of dichlozoline added to grapes at a level of 0.04 ppm and to must, wine, or juice at levels from 0.5 to 1 ppm were excellent. The limit of detection is 0.01 ppm. (Author abstract by permission)

73-3015. McCullough, P. R.; Aue, W. A.* (Dept. of Chem., Dalhousie Univ., Halifax, Nova Scotia, Canada). **"Temperature-programmed" gas chromatography with electron capture detector.** *J. Chromatogr. 82(2): 269-278; 1973.* (40 references)

A flow-controlled, temperature-programmed precolumn, a vent valve, and a pressure-controlled, isothermal analytical column were combined to achieve high sensitivity electron capture gas chromatography. The separations of chlorinated hydrocarbons conducted with this system demonstrate its potential for introducing temperature programming, solvent venting, and peak cutting abilities to the common gas-liquid chromatographic analysis by electron capture. (Author abstract by permission)

73-3016. Vilceanu, R.; Schulz, P.; Draghici, R.; Soimu, P. (Cent. de Chim., Timisoara, Rumania). **Zur Gaschromatographie einiger (1-Hydroxy-2,2,2-trichloraethyl)-phosphonsaeureester. [Gas chromatography of (1-hydroxy-2,2,2-trichloroethyl)-phosphonic acid esters.]** *J. Chromatogr. 82(2): 285-290; 1973.* (19 references) (German)

Acylation of (1-hydroxy-2,2,2-trichloroethyl)-phosphonic acid esters leads to derivatives with excellent gas chromatographic properties, unlike the non-acylated title compounds, which usually decompose on most of the columns investigated. An efficient acylating agent is proposed. The acetylation kinetics of the acylating reagents are investigated over a range of temperatures and concentrations. (Author abstract by permission)

73-3017. Frei, R. W.; Lawrence, J. F. (Anal. Res. and Develop., Pharmaceutical Dept., Sandoz Ltd., 4002 Basel, Switzerland). **Fluorigenic labelling in high-speed liquid chromatography.** *J. Chromatogr. 83: 321-330; 1973.* (22 references)

Fluorigenic labeling techniques have been used for several years in conjunction with thin-layer chromatography, and are now being used also to good advantage in high-speed liquid chromatography. In this work, reagents such as 4-chloro-7-nitrobenzo-2,1,3-oxadiazole, dansyl chloride and dansyl hydrazine were used for the fluorigenic labeling of carbamates, ureas, organophosphorus compounds, aliphatic amines, aldehydes, ketones, biphenyls and some compounds of pharmaceutical interest. The labeling reactions and the nature of derivatives are discussed, together with the column liquid chromatographic properties of these derivatives in both liquid-liquid and solid-liquid modes. Detection limits obtained for most compounds with a new fluorimetric detection device range between 1 and 10 ng per 4-μl. injection volume. The method is suitable for quantitative analysis, with a reproducibility of ca. 3% relative standard deviation. Linear calibration plots for peak area or peak height versus concentration were observed up to 600 ng per injection. The method has been applied successfully to the environmental sample analysis of pesticides in water, soil, and vegetables without the necessity for a preliminary clean-up. The method is comparable in sensitivity and accuracy to gas chromatography. The advantages of this method can be summarized as follows: improved detection properties, such as better sensitivity, flow-insensitive detection mode, and higher specificity; lowering of polarity of the compounds, hence greater ease of separation; and suitability for automation and routine analysis. The range of possible applications is limited only by the available labeling reagents and separation procedures. (Author abstract by permission)

73-3018. Eisenbeiss, F.; Sieper, H. (E. Merck, Darmstadt, Germany). **The potential use of high-performance liquid chromatography in residue analysis.** *J. Chromatogr. 83: 439-446; 1973.* (2 references)

High-performance liquid chromatography is introduced as a new procedure for the determination of pesticides or pharmaceutically active ingredients in plant or animal materials. The most important factors influencing the efficiency of a residue method, e.g. detection limit, reproducibility and linearity, are comparable to those of gas chromatography, if suitable column packings and sensitive detectors are used. Moreover, liquid chromatography has the advantage that less volatile substances and substances that decompose rapidly at high temperatures can be detected. The exact identification of residues using more than a single analytical method will become more important in the future. Thus, liquid chromatography can also find its place in "confirmatory analysis". The results of experimental investigations with pesticides confirm that high-performance liquid chromatography can be regarded as an alternative or a supplementary method to conventional methods such as gas chromatography. (Author abstract by permission)

73-3019. Nawa, H. (Prof. Hiraki School of Intern. Med., Fac. Med., Okayama Univ., Okayama, Japan). **[Studies on intoxication by agricultural organochlorine pesticides. I. A simplified method of detecting organochlorine pesticides in peripheral blood and its application.]** *Okayama Igakkai Zasshi (J. Okayama Med. Soc.) 85(1/2): 35-45; 1973.* (55 references) (Japanese)

Although almost all chlorinated hydrocarbon pesticides have been banned, chronic intoxication by such pesticides may still be encountered. Attempts were made to detect such pesticides as quickly as possible in

peripheral blood without cleanup, using gas chromatography with ECD. Simultaneous recovery values of γ-BHC, aldrin, dieldrin, and *p,p'*-DDT added at 0.5 μg each to 5 ml of rabbit blood were 78.5, 68.4, 70.5, and 60.3%, respectively, after extraction with petroleum ether (10 ml) and injection of a 5-10 μl. aliquot onto an ECD gas chromatograph. Dieldrin, aldrin, γ-BHC, and *p,p'*-DDT were administered to rabbits orally or subcutaneously; blood taken from the rabbit ear was extracted with petroleum ether. After addition of a small amount of anhydrous sodium sulfate and evaporation of the solvent, the residue was redissolved in petroleum ether for gas chromatography. The minimum concentrations of organochlorine pesticides detectable by this method are 0.008 ppm dieldrin, 0.003 ppm aldrin, 0.02 ppm *p,p'*-DDT, and 0.003 ppm γ-BHC. Various organochlorine pesticides can be determined separately by combining several conventional columns in a gas chromatograph, e.g., 1.5% SE-30, 10% DC-200 + 15% QF-1, and 1.5% OV-17.

73-3020. Glennie-Holmes, M. (Agr. Res. Inst., Wagga Wagga, New South Wales, Australia). **A rapid method for the determination of total acid equivalence of sodium salt pesticides using a cationic ion exchange resin.** *Pestic. Sci. 3(6): 681-684; 1972.* (3 references)

The total acid equivalence determination is often used to assess the purity of herbicide formulations. Since direct titration after extraction with ether under acid conditions and washing the solvent to remove mineral acids is hazardous, a modification of the method in which the sample is passed over a column of cation exchange resin and eluted with aqueous acetone or other eluants was examined. The eluate (50 ml) is titrated with 0.1 *N* sodium hydroxide using phenolphthalein as indicator. Sodium chloride, if present as an impurity, interferes with the method described; the extent of this interference is calculated after Volhard titration of chloride ion with silver nitrate. The column technique is preferable to a shaking technique in that it requires smaller excesses of resin. The resin may be regenerated for reuse. Low recoveries were obtained for chlorfenac-sodium and 2,4-D sodium using ethanol as eluant. With acetone as the eluant, recoveries were 94% and 100%, respectively, based on the direct titration value. Recoveries for sodium fluoroacetate, dalapon-sodium, and sodium trichloroacetate using acetone/water as eluant were 100.1, 99.8, and 100%, respectively.

73-3021. Karleskind, A. (Laboratoires Wolff, Paris, France). **Les pesticides dans les huiles et corps gras. [Pesticides in oils and fats.]** *Prod. Probl. Pharm. 27(11): 1098-1107; 1972.* (9 references) (French)

Extraction and preparative and chromatographic techniques for the determination of organophosphorus and organochlorine pesticides are described, and routine determinations of residues in oil, animal fats, and adipose tissues are discussed. By its simplicity and rapid execution the Storherr sweep codistillation technique appears most suitable for serial tests. After separating the insecticides from the solvents, the organochlorine insecticide solution is passed over a florisil column for further purification prior to qualitative and quantitative determination by gas chromatography. Electron capture detectors are used for organochlorine pesticides and thermionic detectors for organophosphate pesticides. Actual analyses of colza seed oils for BHC residues revealed that the removal of the mucilage, neutralization, and decolorization have no effect on the residue levels; deodorization is highly effective in the removal of organochlorine pesticide residues. BHC isomers, heptachlor epoxide, dieldrin, and DDT with its metabolites were detected most frequently in bovine and porcine adipose tissues.

See also 73-2812 73-2833 73-2980 73-2991

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